Telephony

THE AMERICAN TELEPHONE JOURNAL

PUBLISHED EVERY WEEK
BY TELEPHONY PUBLISHING CORP.
116 S. MICHIGAN AVE., CHICAGO, ILL.

JANUARY 3, 1920. [Vol. 78. No. 1.]

Entered as second-class matter Sept. 4, 1908, at the post office at Chicago, Ill., under act of March 3 1879.

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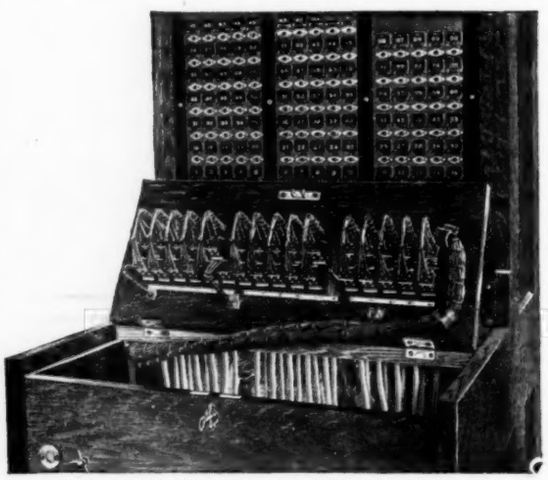

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Telephony.

THE AMERICAN TELEPHONE JOURNAL

Comprising Telephony, American Telephone Journal, Telephone Weekly, Telephone Magazine, Telephone Securities, The Telephone, Sound Waves.

PUBLISHED WEEKLY BY TELEPHONY PUBLISHING CORP.
116 S. Michigan Ave., Chicago

H. D. FARGO, President and Treasurer. S. R. EDWARDS, Secretary and Editor. J. R. HASTIE, Vice-President and Advertising Manager
G. M. ALLEN, Mgr., Copy Department. L. M. PETERSON, Assistant Editor S. J. BORCHERS, Assistant Advertising Manager.

Entered as second-class matter September 4, 1908, at the post office at Chicago, Ill., under act of March 3, 1879.

Volume 78
Number 1

CHICAGO, SATURDAY, JANUARY 3, 1920

Subscription—10 Cents a Copy
$3 a Year U. S., Cuba and Mexico
$4 Canada, $5 Other Countries

CURRENT OPINIONS AND COMMENTS

Two letters came in to Telephony's office last week from telephone companies protesting vigorously against the niggardly policy of their state commissions regarding a raise in rates. One was from a comparatively small company with 250 telephones, operating in Nebraska. The other was from a successful, growing company with upwards of 3,000 stations, doing business in Minnesota.

What these two correspondents say about the stinginess of the Nebraska and Minnesota utility rate makers sounds about as hostile as an exchange of greetings between the White House and the United States Senate would be if they expressed their feelings frankly and told the plain unvarnished truth.

Both the small and the larger company attribute the unwillingness of the commissions to grant adequate rates to politics. Our Nebraska subscriber believes the commission is favoring the farmers who, of course, have more votes in that state than any other class. The Minnesota reader bitterly declares that whenever his commission considers a rate case the members keep their eyes fastened on the wall where they are visualizing the votes to be made or lost by their official action.

* * * *

The extent of the Minnesota man's grievance may be measured by the fact that he almost wishes the federal government had retained control of the wires—and he was vigorously opposed to public operation, too.

"When 90 per cent of the state commissions," he says, "are fighting higher rates much more forcibly than the government thought of doing, why should the telephone companies feel so thankful to get their properties back? As a telephone subscriber I should feel encouraged to hope for better service—if I believed the state commissions would permit sufficient rates to warrant better service—but so long as state commissions see votes all over their walls even while they are considering telephone rate cases, why should the telephone owners be especially hopeful or thankful?"

* * * *

Utility commissioners are human, and no doubt gauge their official acts by the results they will bear on their successful continuance in office. They are not especially interested in swelling the revenues of telephone companies. Neither are they lying awake nights about efficient service for the telephone subscriber.

They are chiefly concerned in making a good record that will reflect credit on their administration. This is putting it baldly, but it is the cold truth. They are seeking public approval.

Now, the public wants good telephone service, and if rates must be raised to insure good service the public will see that the commission grants the increase.

The operating company, therefore, should convince the telephone-using public that justice and efficient service demand more compensation. The public convinced of that fact, the battle is won, for the average commission has its ears to the ground to catch the popular sentiment.

* * * *

Of course the perfect ideal would be to have a commission so wise, so just, so far removed from all personal influences that it would make an impartial survey of the situation and issue an order that would hit in right every time. The fact is, however, this ideal is not humanly possible. Members of rate-making commissions are men of flesh and blood, "even as you and I," and are prone to err and subject to the same influences that sway all mortals.

Some people thought the world was coming to an end December 17, but it didn't. If state commissions ever disregard politics entirely, we may then have good reason to believe that the end of the world is near at hand.

* * * *

Publicity will tremendously help telephone companies seeking higher rates. This point has been made often before, but it cannot be emphasized too strongly. The winning of public sentiment in favor of more compensation will supply the utility with a powerful argument to lay before the commission. It is, in fact, a prerequisite.

The United States Independent Telephone Association is working on a publicity plan which is designed to fill a long-felt want, and should receive the support of the entire industry. With a well-conceived publicity campaign in operation by

Independent companies, petitioners for rate increases will find their task much easier. Watch for the official announcement, and support the association's plan vigorously.

* * * *

That the adequacy of service bears a direct and important relationship to the reasonableness of telephone rates is emphatically reaffirmed by the Oregon Public Service Commission in a recent ruling in which it orders the Pacific Bell company to cease charging and collecting the exchange rates as increased upon authority of the Postmaster General.

In its opinion in this proceeding the commission states that the company has deliberately, or otherwise, apparently disregarded the public interest. By its methods it has aroused on the part of patrons, the rate payers, a spirit of antagonism or resentment that, beyond reasonable doubt, has materially and adversely affected the company's revenues. The commission asserts that it will not countenance a continuance of the deplorable conditions that have heretofore and are now existing as regards the service afforded.

* * * *

"The company in advocating its cases," the commission continues in its finding, "is generally, if not exclusively, interested in the presentation of statements of revenues and expenses, while the value of the service to the patron, his ability to pay, and the service afforded for the rate received or requested, is apparently of very minor importance to the company officials, inasmuch as these latter items are seldom, if ever, mentioned. This commission naturally concedes the relevancy and importance of a financial showing, but certainly not to the exclusion from our consideration of the general service conditions and other circumstances surrounding the case."

Telephone executives will find much food for thought in the views set forth by the Oregon commission in this proceeding in regard to the relationship of service and rates. They corroborate the holdings of the Wisconsin Railroad Commission in the recent case in which it denied an increase in telephone rates because the plant and equipment were run down and the service unsatisfactory.

Many Thrills in Year Just Closed

"Telephony's" Annual Review of the Telephone Industry for 1919 Indicates That High Cost of Living Was Factor Responsible for Much Trouble—Federal Control, Wages, Rates and Service—Other High Spots

By Stanley R. Edwards

The year just closed was surely a strenuous one all the way through. Government control and operation, particularly the early part of the year, furnished thrills of all kinds for everyone—employes, managers, stockholders, subscribers, public utility commissioners, lawyers and the courts, both high and low. Everyone was concerned with the high cost of living.

From the standpoint of the companies, the most important matter was that of obtaining revenues sufficient to meet the increased costs of operation. Many companies obtained rate increases directly through government action; others through their respective state commissions. A number of the commissions recognized the emergency and protected the companies by granting increased rates during and since the government control period.

A great deal could be written relative to the rate situation and all the complexities which arose. The government early recognized the need for increased revenues and took prompt steps to obtain them. The installation and move charges and the new toll rate classifications were measures designed to obtain a general increase of revenues, while many individual companies were authorized to make specific increases in local exchange rates.

The power of the Postmaster General to make these charges was questioned by the public and state commissions, but when the matter was carried to the United States Supreme Court, his authority was upheld and all of the restraining injunctions against the putting into effect of the various schedules were dissolved.

Upon the release of the companies from federal control on July 31, the commissions began investigation of the reasonableness of all of the various schedules which had been put into effect by the Postmaster General. The law releasing the companies provided that the rates in effect prior to June 6 be continued until December 1, unless otherwise changed by the proper authorities. Most of the commissions endeavored to complete their investigations and render rulings by that date.

In many cases the rates were continued for periods of six months to a year during which time conditions are to be thoroughly investigated. Several commissions, however, disapproved the charges for new installations but authorized the companies to collect a deposit fee. On the other hand, some of the commissions whose decisions are noted for their soundness, upheld the principles of the installation and move charges and authorized a continuance of specific schedules.

All in all, it may be said that the companies which were entitled to increased rates usually received them, although in the majority of cases they were not as large as the companies deemed sufficient. But they have helped to alleviate the acuteness of the companies' situation.

Service which had deteriorated during the war period did not recover its prewar status, although most of the companies have made special efforts to improve it and bring it up to a satisfactory standard. The shortage of help became less acute toward the end of the year, due to former employes who had been in the service returning to civilian life and taking up their old work.

The high cost of living was reflected by the requests and demands of employes for increased wages. Of course, there were conflicts and differences of opinion as to what the increases should be. In most of the cases the differences were satisfactorily adjusted and the furnishing of service was not interfered with. In some few cases strikes were inaugurated

which extended over a period of weeks, resulting in losses of all kinds not only to the employes and companies involved but also to the public as well.

As the year closed, all of these disputes relative to wages are believed to have been settled.

The deterioration of service, particularly in the larger cities, was due mainly to the fact that the traffic had largely increased owing to an increase in volume of business being transacted, and hence a greater use of the telephone. The operating forces, which had been greatly depleted due to various war conditions, were unable to handle the traffic, and it was impossible to secure and train new operators fast enough to render efficient service. One of the larger companies, in an official statement, declared that it was possible only to secure and train sufficient new operators to replace those leaving the service for various reasons.

The increasing shortage of operators was one of the factors which was influential in the decision of the Bell company to install, particularly in the larger cities, automatic equipment for switching purposes. For a number of years the trend, as regards switching equipment, has been toward the adoption of automatic features and the elimination of the human element, insofar as is possible.

Announcement was made by the Bell company about the middle of the year of its intention of installing automatic equipment in the larger cities in which it operates, and work has already commenced preparatory to the installation of this type of equipment in several of the cities. It is expected that it will take several years before these cities will have a complete automatic service, it being the intention to cut an office into service as soon as installed and operate it automatically in connection with the manual offices.

In connection with increasing rates charged for telephone service, it is generally recognized that there is a point above which rates cannot be raised. And if that point is passed, the company will be in just the same position as if its rates were extremely low. In other words, if a company cannot operate at this upper limit of rates so as to secure a reasonable return on its investment, the net revenue return will probably be very much less, even if rates are increased, by reason of a falling off in patronage on account of high rates.

The alternate method of procedure is to reduce operating expenses. This cannot, of course, be done by reduction of wages, so that the result must be secured through greater efficiency. This efficiency may be secured either from employes or through the use of better equipment which enables an employe to perform more work in less time and with less expenditure of energy. In fact, efficiency may be secured both on the part of the employe and the equipment. The greater the efficiency thus attained, the more prosperous the company and its employes.

Along the lines of service, several commissions have recognized that in the granting of increased rates service is a factor. At its convention last winter, the Wisconsin State Telephone Association authorized the appointment of a committee to investigate principles of service and general standards. A preliminary report of this investigation was made late in the year. Undoubtedly the start which this association has made along the lines of improving service and the formulating of definite standards of service, will be productive of good results not only in Wisconsin but in other states as well.

The experience of the companies with the federal authorities during the period of government control thoroughly demonstrated the value of membership in the state and national associations. Consequently the membership in these organizations is the largest in their respective histories.

New associations were organized in two states, Georgia and Virginia. The two associations in Pennsylvania were consolidated into one exceptionally strong organization which, it is planned, will do most efficient work in the future for the Pennsylvania companies.

The broadening out of the field is indicated by the opening of the membership doors of the Nebraska and Indiana associations to all telephone companies. This was done with the thought that the interests of Independents and Bell are mutual and that they should work together.

The United States Independent Telephone Association confined its activities during the year to looking after the affairs of the Independent companies in Washington. As the organization is financed from the first of the year for the entire year, the plans outlined at the convention in June for increasing the scope of the work of the association, could not be placed in effect until the new year.

President MacKinnon has, however, formulated quite an extensive program looking to making the association of great practical help not only to the companies but to individuals as well. The first of this new program, which is being inaugurated, is that of providing a medium for the supplying of publicity material to the member companies at a most moderate cost. This service is being eagerly subscribed to by the companies, and the plans will be placed in operation very shortly.

During the year there were announcements of a number of agreements by which dual telephone service will be eliminated in a number of communities. Generally speaking, the elimination of competition provided for the giving up by the Bell company of telephones equal in number to those acquired.

The passage by the Pennsylvania legislature, last spring, of a constitutional amendment paved the way for consolidation of systems in that state. Up to the present time, however, no announcements have been made of the consolidations which will be effected but it is quite certain that the Independent companies in Pennsylvania will be materially strengthened through whatever exchange of properties may be made.

During the war the inventive powers of the industry were devoted to the production of devices for war purposes. Some of the ideas which were thus developed under forced pressure are ap-

A New Year's Wish.

May the New Year keep our hearts and hands busy with productive toil, leaving neither time nor opportunity for idleness and discontent; may it sweeten our daily bread with the thought that it has been earned by honest service; may it free us from the sin of self-pity by revealing to us a vision of the Divine purpose that made labor the law of life.—Paragrafs.

plicable to peace-time use and progress has been made in their commercial adaptation.

The prosperity of the telephone industry depends upon the general prosperity of the country, so the prediction of the committee on statistics of the Chamber of Commerce of the United States of sustained industrial activity, is of particular interest. The committee this week issued its regular end-of-the-year review of business and crop conditions. It emphasized the hopefulness of the manufacturing industry generally, which although encountering constant labor troubles and shortage of fuel and materials, has orders in excess of its capacity for production within any reasonable time.

"Among the vast numbers of retail dealers," says the report, "there seems to be a confidence in the continuation, at least until another harvest, of the present great demand for commodities of all kinds because of the unexampled strength of the agricultural situation.

"On the whole, the farming communities are prosperous because of the high prices of their products, and their liberal spending is the backbone and sustaining power of the present volume of business in much the greater part of the country. The farmer is buying liberally and intelligently. He is buying more automobiles, more tractors, more poultry, more blooded cattle, more farm implements and machinery, more gasoline engines and electric lighting plants for his dwelling house and buildings. He is paying cash mostly and also paying off what comparatively few mortgages remain."

Great activity in building is reported in sections except where crop failures were extensive. Soft coal mining is in poor shape in contrast to the mining of hard coal. Copper mining is in a poor state. Silver mining is doing well and oil production is good.

Surely with such an optimistic forecast of general business, the telephone industry should have a good year in 1920.

"Wired Wireless" Possibilities

Perfection of Multiplex Telephone System of "Wired Wireless" Soon to Be Announced by Major-General George O. Squier—Outline of Method and Some Possibilities in Way of Transmitting Simultaneous Conversations

The perfection of a method of "wired wireless," by means of which at fewest ten and possibly more conversations may be carried on simultaneously by means of a single wire by persons thousands of miles apart, will soon be announced by Major. Gen. George O. Squier, chief signal officer of the army, it has just been learned.

The method, it is said, makes long distance telephone communication virtually limitless. Conversations from Nome to Rio, and from Argentine to Alaska will be a matter of course, provided single wires are strung between the points mentioned. The new method, it is stated, will save telephone and telegraph companies large sums of money, as by its use one wire will do the work now done by ten or more.

It is expected to put the new method in practical operation between New York City and Albany in the near future.

Successful tests of the method have been made by government experts recently along the line of the Harlem division of the New York Central Railroad. The experiments are still going on, but the results have been so gratifying that General Squier will soon make his formal announcement.

A government experiment car has been established at Millerton, Dutchess county, N. Y., under the direction of Lieutenant R. D. Duncan. The experiments were begun by General Squier in 1909, and in 1911 he patented his method, dedicating it to the public and thereby renouncing a potential fortune.

Little work had been done to perfect the method when the war began, and after that General Squier had little time to work on it until the armistice was signed. Since then the experiments have been pushed with vigor.

Wires Guide Radio Currents.

"Wired wireless" is a system of guiding radio currents by means of a wire. The currents travel through the air alongside the wire, which guides them to their destination, it was explained. The method eliminates one fault of the ordinary radio, which sends the messages broadcast in all directions. Under the Squier method the wave currents stay close to the wire, thus insuring reliability and secrecy.

The principal difficulty in long distance telephoning has been that to carry the direct current to a great distance requires conductors so large as to be almost impracticable. The new method has adapted an alternating current of high frequency to the use of the telephone through adaptation of the instruments used in wireless telegraphy to the purpose.

The high-frequency current travels along the wire, but not in it, passing through the ether as do radio waves, with the difference that instead of being diffused it travels in a path of which the wire serves as a core. Enthusiastic persons who know of General Squier's work believe that as many as 50 messages may be sent along one wire simultaneously.

War Gave Impulse to Experiments.

The congestion of telephone and telegraph service during the war gave an impulse to further experimentation with the new method, with the result that those interested in the work believe they have found a way to eliminate wire congestion for good and all. On the ordinary telephone wire, an alternating current is used, employing a frequency of from 750 to 2,500 cycles a second. The Squier method increases the frequency and rapidity of the vibrations so that they "step up" to as high as 500,000 cycles a second, a feat which electrical experts had thought impossible.

In addition to its other uses, it was said the new method would enable conversation to be carried on between people on moving trains and friends at fixed points. The method entails no additional expense to telephone and telegraph companies except the cost of generators to produce the high frequency current at either end of the line.

General Squier was impelled to renounce all rights in his patent in favor of the public because, to use his own words, "when an army man begins to think about money, he begins to forget about the army." The general's chief personal interest in developing it, according to his friends, is to obtain its benefit for humanity. Its establishment, he believes, will do much to remove causes of international friction. Communication would be made so inexpensive that widely separated peoples no longer would regard their long distance neighbors as potential enemies.

Talk between South America and the United States along the line of wires already existing between the continents would soon be practicable, it is said. All that would be needed would be a generator of an alternating current, transmitters and receivers. The cost of generating the current would be small.

Automatic Telephone Switching

The Applicability of Automatic Equipment for All Classes of Telephone Service—Abstract of Paper Published in the December Issue of the Proceedings of the American Institute of Electrical Engineers—First Installment

By Arthur Bessey Smith

Automatic apparatus of various kinds has been described so often that a general explanation is unnecessary. The type best known has been the subject of Institute papers, as well as of a few books.

Equipment Characteristics.

Factor of safety is a thing of great importance. Upon it depend the maintenance expense and the dependability of the service rendered to the public. This is the principle which guided the development of automatic switching. Seemingly small details exert great influence upon the performance of apparatus. Some factors do not impress the casual observer, yet they have great influence upon results.

A brief presentation of some of the improvements which have been made in recent years will bring the record of the subject up to date. It concerns chiefly the redesign of parts of the apparatus and the standardization of the assembly, adjustment, and mode of maintenance.

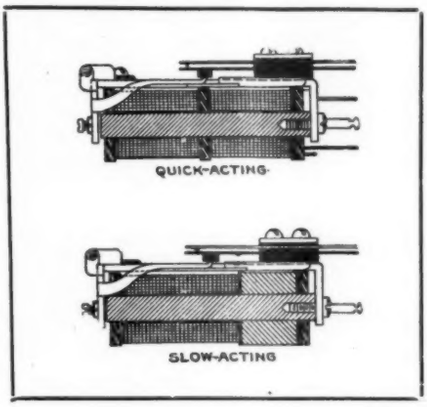


Fig. 2. Horizontal Automatic Relays.

The automatic switch, Fig. 1, presents a new general appearance. The relays are mounted above, the magnet mechanism in the middle, and the banks and wipers below. The relays and magnets are protected by a cover individual to each switch.

The material of the switch frame has been changed from die-cast metal to cast iron, heavily zinc plated. The die-cast frame was subject to warping. It necessitated rather frequent re-adjustment of the mechanisms mounted on it and sometimes even the chipping down of a lug which interfered with the movement of the wiper-shaft. The cast iron frame is rigid and unchanging. Apparatus mounted on it requires no attention from this cause.

The sideswitch has been abolished on nearly all switches and its work performed by relays. The sideswitch as made was the source of considerable trouble due chiefly to the wiper friction. Its elimination has greatly increased the certainty of action of the switch as a whole.

The relay has been completely redesigned (Fig. 2). The pin-pivot has replaced the point-pivot, the insulation between contact springs made permanent, and each relay rendered mechanically independent of all other relays.

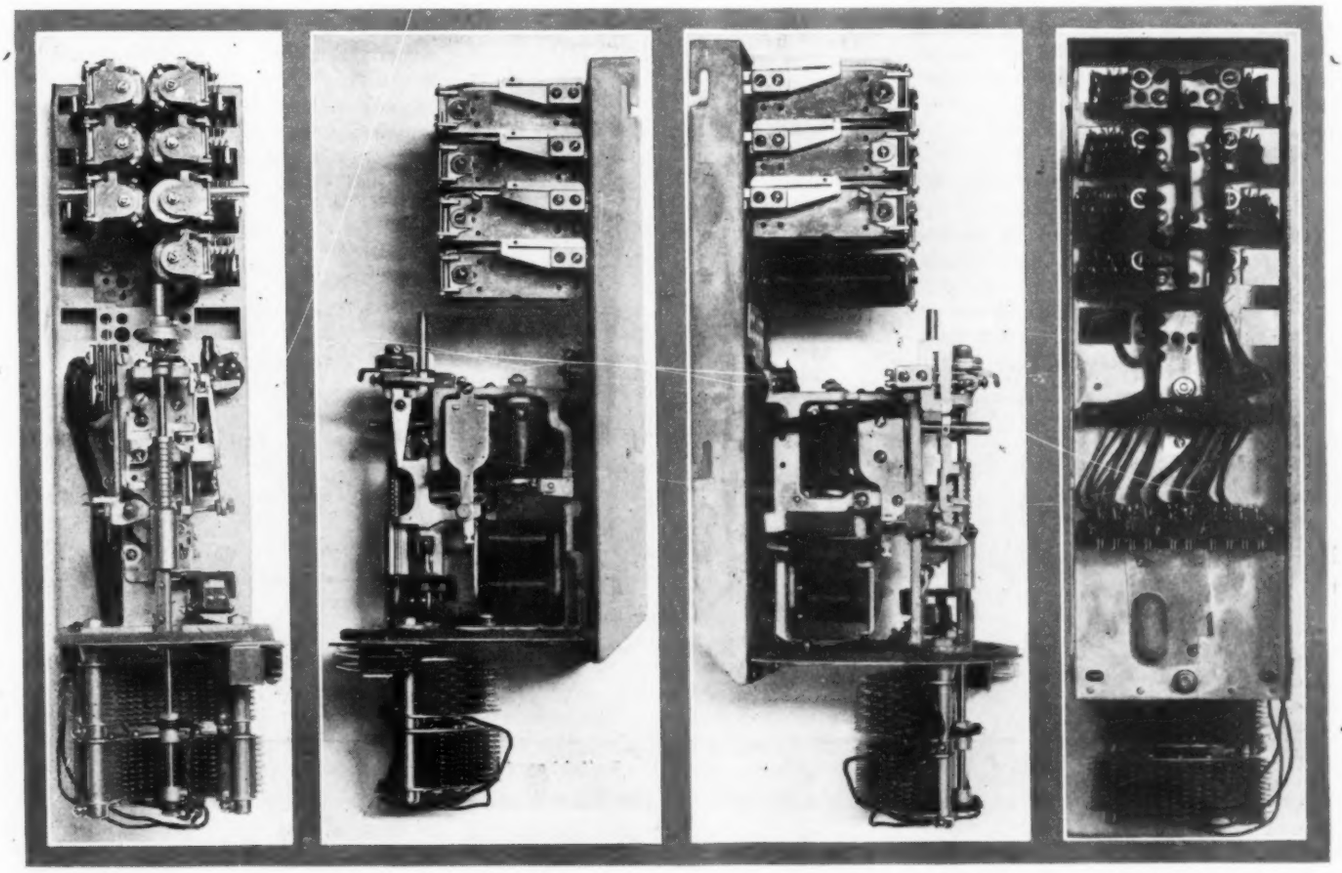


Fig. 1a. Connector Switch (Front View).

Fig. 1b. Connector Switch (Right View).

Fig. 1c. Connector Switch (Left View).

Fig. 1d. Connector Switch (Rear View Uncovered).

The point-pivot, when adjusted without play or bind was as fine a pivot as could be made. But it was desired to have a pivot which would need no adjusting at all. The plain pin pivot has just enough play to make the armature work freely, and the wear is inappreciable. The point pivot is retained on the line relay of the plunger line switch, where the conditions are not severe.

The relay contact springs are insulated by phenol-fibre, which is a good insulator and very constant. Each assembly of springs is aged by heat treatment, so that it is practically one solid mass. Looseness and uncertainty of spring action have been practically wiped out.

The relays are mounted individually on a base plate Fig. 3. This base plate has openings through which the relay terminals (for coils and springs) extend to the rear. There the wiring is placed, connecting the relays together in a compact but accessible place. A plate covers the wiring so that none of the wiring on this part of the switch is exposed. The few wires which feed the magnets and wipers pass through a single hole in the base plate. The base plate carries also the switch frame, in which the vertical, rotary, and release magnets are mounted.

The adjustment of an automatic switch may be divided into two parts—the relay adjustment and the adjustment of the motor magnets. Every relay is adjusted to a definite armature-stroke with a fixed residual air gap. The amount of contact that each spring makes with its mate is likewise fixed. These distances are measured with thickness gauges placed between the armature and the pole of the magnet.

The contact springs of each relay are given a tension which is measured in terms of the operating and non-operating currents. Thus the spring tension is kept within limits.

The motor magnets — vertical, rotary, and release—are adjusted in a definite sequence to the proper relations to the wiper-shaft. These relations are also expressed in distances, most of them measured by thickness gages.

The final performance of the completed switch is tested by being operated over a line under conditions worse than any imposed by commercial use. The calling device delivers impulses at 14 cycles per second with an impulse ratio of 61 per cent (circuit opened 0.61 of total impulse period). One test employs a line of zero loop resistance with a 20,000-ohm leak across it. The other test employs a 1,200-ohm line without leakage.

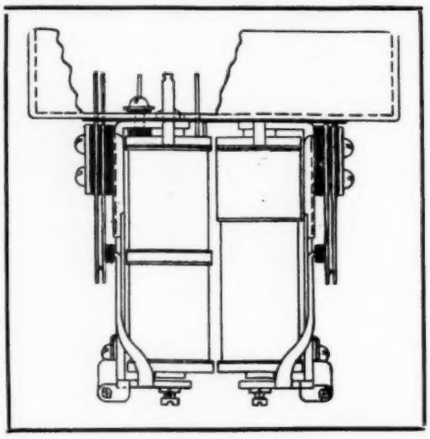


Fig. 3. Automatic Relay Mounting (Top View).

The spring tension of the motor magnet armature is adjusted so that perfect operation is secured under these two extremes of line conditions, with the battery voltage between 46 and 49 volts.

The control of automatic switches over the subscriber line is a telegraph problem. The elements involved, Fig. 4, are the line circuit, the release relay circuit, the motor magnet circuit and the release magnet circuit. All but the line circuit are wholly within the central office where the conditions are constant. Each element contributes its share toward fixing the line characteristics which are necessary for operating a switch.

The normal operation is as follows: The calling device springs, *CD*, are opened and closed as many times as there are units in the digit being transmitted. The line relay, *LR*, follows these impulses. The release relay, Rel-Ry, having a copper collar remains energized during the series. The series relay pulls up the first time the line relay falls back and remains energized during the series of pulsations to which the magnet, *VM*, responds by moving the wiper shaft the required number of steps. At the end of the group of impulses, the line relay comes to rest energized, the series relay falls back and causes the local circuit to be changed to suit the next action.

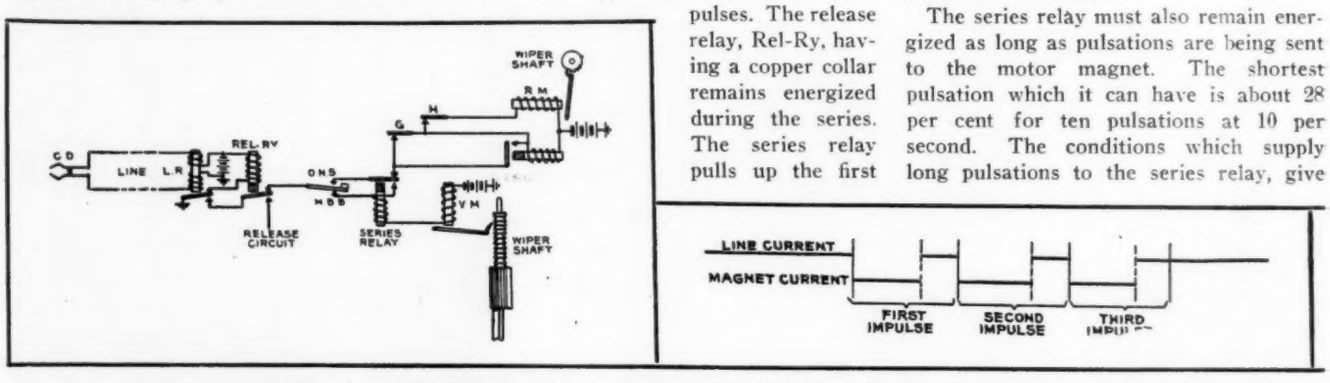


Fig. 4. Controlling Circuit for Automatic Switchboard.—Fig. 5. Impulses.

The period of an impulse, Fig. 5, is the time from the opening of the line to the next opening of the line. It includes a "break" and a "make." The upper line represents the time that the line current is flowing. It is shown as broken three times, as in sending the digit "3." Each opening of the line produces one pulsation to the magnet. This is represented by a line just below the break in the line current. Owing to the delay of the line relay in obeying the current, there is a little time-lag at the beginning and at the end of each pulsation.

The impulse ratio is the ratio of the time that the line is opened to the total period of the impulse. Applied to the magnet, it is the ratio of the time of current flow to the total period of the impulse. Formerly a 50 per cent (0.5) impulse was used. It has been found that a longer opening of the line circuit gives greater certainty to the selection, so that 61 per cent (0.61) is now used. The reasons are discussed below.

The release relay must be held energized continuously, because when it falls back it will cause the switch to release. The greatest break in current which the release relay can stand without letting go is about 77 per cent. (For a group of 10 impulses at 10 per second.)

At the beginning of a group of impulses, the release relay is fully energized. While the line relay armature is vibrating, the release relay is kept energized by pulsations fed to it, one pulsation each time the line relay pulls up. If these pulsations are short, the magnetism will not be fully restored each time but will gradually run down. There is always enough magnetism remaining to hold the armature to the end of ten impulses. The aging of a slow-acting relay (equipped with a copper collar) always tends to make it hold better.

The series relay must also remain energized as long as pulsations are being sent to the motor magnet. The shortest pulsation which it can have is about 28 per cent for ten pulsations at 10 per second. The conditions which supply long pulsations to the series relay, give short ones to the release relay. But the short pulsations which each can endure give a large range through which the ratio can vary without causing either relay to cease to function properly.

The vertical magnet requires at least a 27 per cent pulsation and not more than 86 per cent for satisfactory operation under the same conditions. Being in series with the series relay, it gets the same impulse ratio. Since the magnet has considerable work to perform, it can stand a very high ratio.

The rotary magnet of a connector can stand a variation of impulse ratio from 30 per cent to 95 per cent.

The total performance of the automatic switch is judged from the standpoint of the subscriber's line. Ordinarily a switch is adjusted to work over lines of varying length. This is because any telephone may use almost any switch. Sometimes a switch is to be used on one line or trunk only; in this case the line relay can be adjusted to operate on a 2,500- or 3,000-ohm loop. When adjusted for such a loop it would not work well on a low resistance loop (300 ohms and under.) Loop resistance of the subscriber's line does not include the telephone instrument because in an automatic telephone the talking apparatus is cut out during the dialing period.

If the subscriber line is of zero length with no leakance or capacitance, the impulse ratio may vary from 38 per cent to 71 per cent without causing the switch to fail.

The effect of simple line resistance is to lengthen the pulsation delivered to the motor magnet, and shorten the pulsation to the release relay. This results in weakening the release relay so that it may start to fall back near the end of a ten-impulse digit and if the line resistance be excessive may even cause premature release. If the loop is 500 ohms, the impulse ratio may vary from 36 per cent to 72 per cent without causing the switch to fail. If the loop is 1,000 ohms, the limits are 35 per cent and 68 per cent. The margin for safety is ample.

The practical safe limit for a subscriber's line is a loop resistance of 1,000 ohms. This is a greater resistance than is necessary for good common battery transmission, so that any loop which is low enough in resistance for good transmission is good enough for automatic dialing.

The effect of line leakage is to cause the line relay to be slow to fall away and prompt to pull up. This gives the motor magnet and its series relay a shorter pulsation, so that there is less power available to move the switch and a greater likelihood of the series relay not remaining energized throughout the group of pulsations. The practical limit of leakance is about 50,000 ohms for the subscriber's line, measured between wires or from either wire to earth. Since the switches are adjusted to operate perfectly with a leak of 20,000 ohms across the line, the factor of safety is ample.

Distributed capacitance such as found in telephone cable exerts no bad effect upon dialing. A capacitance between the two conductors has a tendency to delay the relay in falling back, and thus to shorten the pulsation delivered to the motor magnet. This partly neutralizes the effect of line resistance. In fact, the capacitance may be increased to seven microfarads without causing the automatic switch to fail.

Lumped capacitance, as found in telephone instruments on a party line, affects the dialing. It is more correct to say that it is the inductance of the bell in connection with the capacitance of the condenser that influences the signals. For this reason the capacitance of condensers used with harmonic bells (5 bells on one party line) is made 0.7 microfarad. With this value at least two more bells could be used without causing any failure of dialing.

In general, line faults have the same effect upon an automatic switchboard that they have upon a manual switchboard. The chief effects are compared in the accompanying table.

	Manual	*Automatic*
Open.	No calls, no indication	No calls, no indication
+ *L* grd.	Line noisy, conversation poor	Line noisy, conversation poor Dialing bad, sometimes impossible
— *L* grd.	Permanent signal	Permanent signal
sht. ckt.	Permanent signal	Permanent signal
	Crosses between lines.	
+ *L* and + *L*	Cross talk	Cross talk, a second trunk occupied but no trouble
— *L* and — *L*	Cross talk, two line signals show when one calls	Cross talk, a second trunk is occupied when one calls
+ *L* and — *L*	Permanent signal on one line	Permanent signal on one line

Comparison of Effects of Line Faults Upon Manual and Automatic Switchboards.

Periodic ringing is the accepted practice, on both individual and party lines. If the subscriber removes the receiver from the hook, the ringing current is cut off at once, even if it occurs during a time of ringing. The cut-off is quick enough to be complete before the receiver reaches the ear.

Party lines are segregated and served by party line boards, 100 lines per board.

The preferred practice is to provide a party line board with four or five groups of connectors, each group being supplied with a different frequency of ringing current. Each subscriber line is multipled to all these groups of connectors. The hundreds digit of the call number selects the group of connectors and therefore fixes the frequency which shall be used. The last two digits control the vertical and rotary motions of the chosen connector as usual. Any group of connectors can equally well connect to the desired line, but the bell which rings depends upon which the group of connectors is used.

An alternative method is to have but one group of connectors per hundred lines and to equip each connector with a frequency selecting device which is operated by the last digit of the call number. It makes each call number one digit longer, but is somewhat cheaper as to initial cost.

Telephone service for intermittent users—other than regular subscribers—is usually furnished by stations equipped with some form of coin-collecting box. For local service, the rate is displayed near or on the telephone instrument together with directions for its use. For toll or long distance service, the user must call for the toll board to receive supervision and information.

The automatic telephone has been successfully equipped with "nickel-first" and "nickel-last" coin boxes. With the former, the deposited coin is held until the called station answers, then a reversal of current operates a polarized relay in the coin box which collects the money. With the latter, the user dials the number as usual; the answering of the called station reverses the battery current which operates the polarized relay in the coin box the latter short-circuits the transmitter and shunts the receiver enough to prevent its use as a transmitter, but still permits hearing that the called station has answered. Depositing the coin clears the transmitter and receiver.

A credit meter is also in use, which records the number of completed connections. It may be attached to the instrument and worked with a push-button (instead of a coin) or may be located apart from the telephone on the subscriber's premises and require no act of the subscriber. An older type is designed to be located in the central office.

If the pay station be used to call a free local number, no current reversal will take place. All free lines are connected to a group of connectors which do not reverse the current when the called station answers.

When the user of a pay station desires an out-of-town connection, he dials the toll recording desk as any local subscriber would do. When the connection is ready, the line operator calls the pay station automatically, requests the payment, and is by sound notified of the deposit of the coins as is the case in manual practice. *(To be continued.)*

"Telephony's" Home Study Course for Telephone Men

A Complete Presentation of the Principles Underlying Modern Telephony in All Its Branches—Arranged Systematically So That Regular Reading and Faithful Study Will Qualify Ambitious Men for Higher Positions—Prepared Under Supervision of Stanley R. Edwards—This Section Written by Jay C. Mitchell

Quiz Questions on the Preceding Installment.

1257. What general statement may be made as to traffic in a local telephone system devoted to private branch exchange service? When is this general statement to be discounted?

1258. When is it advisable to make exact and thorough private branch exchange traffic records? What is a conservative rule as to the traffic for small mechanically-operated private branch exchange equipment?

1259. Why can any given number of mechanically-operated trunk circuits carry a greater traffic load than the same number of manual, private branch trunk and cord circuits? What possibility exists with the manual private branch exchange operator which does not exist with mechanically-operated equipment?

1260. Give another reason for determining the probable maximum private branch exchange traffic demand.

1261. What wrong belief relative to traffic between exchanges is current among telephone men? Why is it wrong?

1262. How is supervision of trunk calls arranged for in a manually-operated private branch exchange? Discuss the circuit.

1263. What is one of the advantages inherent in mechanically-switched equipment for private branch service? To what class of establishments is this advantage most valuable?

1264. Is there more than one type of mechanically-switched private branch equipment available? Outline one form of equipment in which single-motion switches were employed.

CHAPTER XXXII. Mechanical Switching (Continued.)

1265. *Limited service circuit arrangements.*—The service furnished by the private branch exchange may be intended to be available in every particular to all local stations, or it may be modified in such a way as to prohibit outside connections to some. In the case of mechanically-operated private branch equipment of the type being described, this may involve the adoption of means to prevent incoming calls from reaching the prescribed stations as well as to prevent prescribed stations from making outgoing trunked calls.

As first stated, one method of preventing incoming calls from reaching a prescribed local station is to place a permanent ground connection on the private normal bank contact at the incoming trunk connectors serving such lines. When an attempt is made to call such stations over an incoming trunk circuit, the calling station will receive the busy signal.

This is because the circuit conditions, as far as the incoming trunk connector banks are concerned, are the same as those which would be in existence when the local line circuit is actually engaged, due to an existing local call from another station. The calling party, in such a case, will be reasonably satisfied that the station for which he is calling is busy. For this reason, this method is preferable to another, the ostensible reason for failure to secure connection, due to the busy signal, being designed to disarm any public criticism of the service.

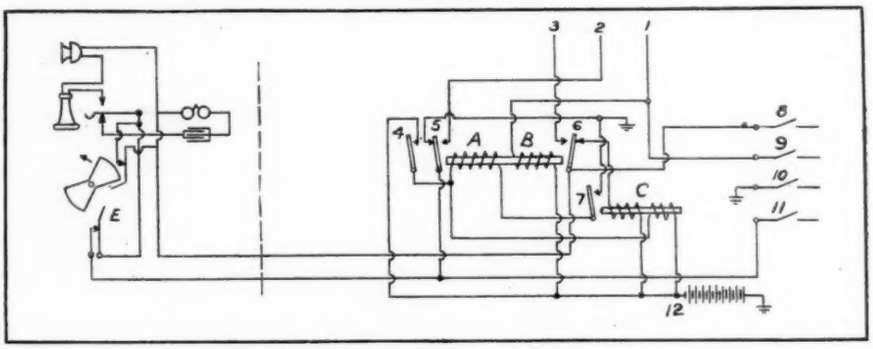


Fig. 289. Circuits of Typical Line Switch.

1266. *A less desirable arrangement.*—Another method that may be employed to prevent incoming trunk connections from reaching specified local stations is to disconnect all the normal wires belonging to the line serving the prohibited local station, from the bank contacts of all the incoming trunk connectors.

When an incoming call is delivered to the bank contacts of such a local circuit, the bridge cut-off relay will not be operated. Should it happen that the bridge cut-off relay is in the operated position due to the existence of another call for the same line, no connection will be effected since the two normals of the line itself are open.

The normals, it will be remembered, are the wires marked "1," "2," and "3" in Fig. 289 and they connect the contacts in the connector banks to the line-switch equipment and, through it, to the local line circuit.

The disconnection of all such "normal" wires from the bank contacts will effectually bar all incoming trunk calls from the stations served by the disconnected lines but will not afford any means of giving the outside calling station the busy signal when such a line is called. For this reason the grounding of the private normal contact in the incoming trunk connector banks is preferable.

1267. *Limited outgoing service.*—All outgoing calls from the mechanically-operated private branch exchange must pass through the banks and wipers of the first selectors. It has been stated that the outgoing service is often withheld from certain lines by the installation of a special trunk circuit impulse repeater. This is not strictly true for the reason that the trunk repeater, being in the outgoing trunk circuits, must serve *all* the local stations making outgoing calls.

In order to bar outgoing calls from certain stations, therefore, it is necessary that the equipment individual to the local line to be so barred, be modified. The modification to be made is one which will render the talking circuit inoperative when such lines call out on the trunk but which will leave the talking circuit in satisfactory operative condition when the connection is purely local. In order to accomplish this result, certain combinations are made possible between the local line-switch equipment and the trunk repeater. One type of trunk impulse repeater for this class of service is shown in Fig. 303.

1268. *Operation of the limiting re-*

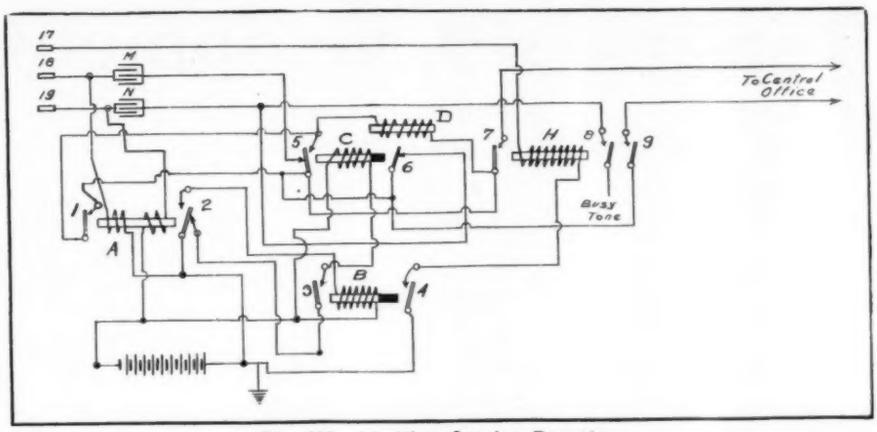


Fig. 303. Limiting Service Repeater.

peater.—It will be noted that the talking circuit through the private branch trunk impulse repeater starts at first selector bank contacts, 18 and 19, includes the two condensers, *M* and *N*, and is looped through the normally-closed contacts, 5 and 6, of slow-acting relay *C* and the normally-open contacts, 7 and 9, of relay *H*. In other words, the talking circuit from the private branch first selector to the central office is not complete unless slow-acting relay C is de-energized and normal and relay *H* is operated.

It will also be remembered that a connection between the grounded terminal of the common battery and the release trunk is necessary in order that the bridge cut-off relay of the line-switch equipment may be energized. While the first selector is being operated, this ground connection is provided by the operation of slow-acting relay *B*. When any selector—a first or one of a later order—has reached the end of the travel of its wiper shaft, this ground connection is provided by the operation of slow-acting relay *B* of the *next succeeding* switch.

A review of the sequence of operation of the various items of equipment in the circuit shown in Fig. 297, will make this fact perfectly obvious. It has an application in the operation of limited service local private branch line circuits as follows:

When the calling private branch subscriber has released the sending device held in the operated position owing to the flow of current through the sending device in normal position at the calling telephone.

Since the double-wound line relay, *A*, is energized and operated, the circuit through the winding of slow-acting relay *B* is closed and slow-acting relay *B* is operated.

The operation of slow-acting relay *B* completes the path for a flow of current through the winding of relay *H*, the bank contact, 17, the release trunk of the private branch first selector, the line-switch bank contact 9 (Figs. 289 and 296) the winding of the bridge cut-off relay *B* (Fig. 289), the common battery, and the grounded terminal back to the armature contact, 4, of slow-acting relay *B* (Fig. 303), the starting point.

The current passing through the winding of relay *H*, therefore, is the current passing through the winding of the bridge

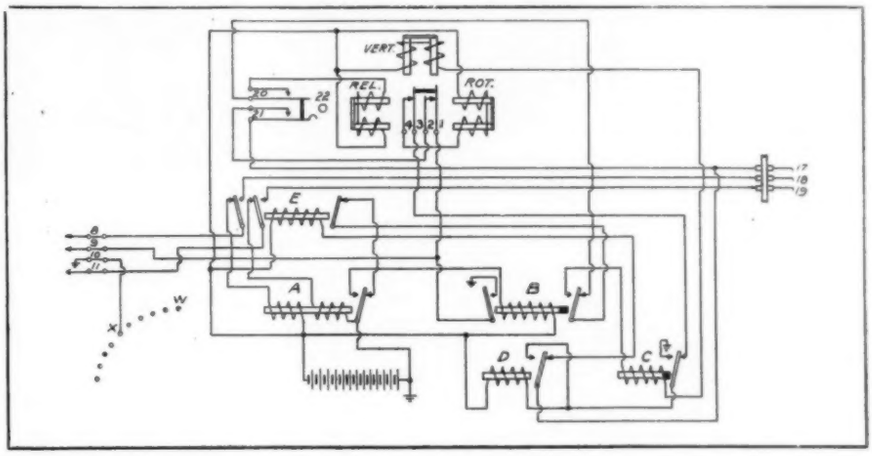


Fig. 296. Two-Wire First Selector Circuit.

for the distinctive central office digit, the first selector has seized the bank contacts, 17, 18, and 19 leading to the trunk repeater shown in Fig. 303. At this stage in the progress of the call, the double-wound line relay *A* of the repeater is cut-off relay *B*, Fig. 289, and the release trunk. Now relay *H* is a very good illustration of marginal relay operation.

Its resistance is made very low so that its winding consists of comparatively few

(*Continued on page* 28).

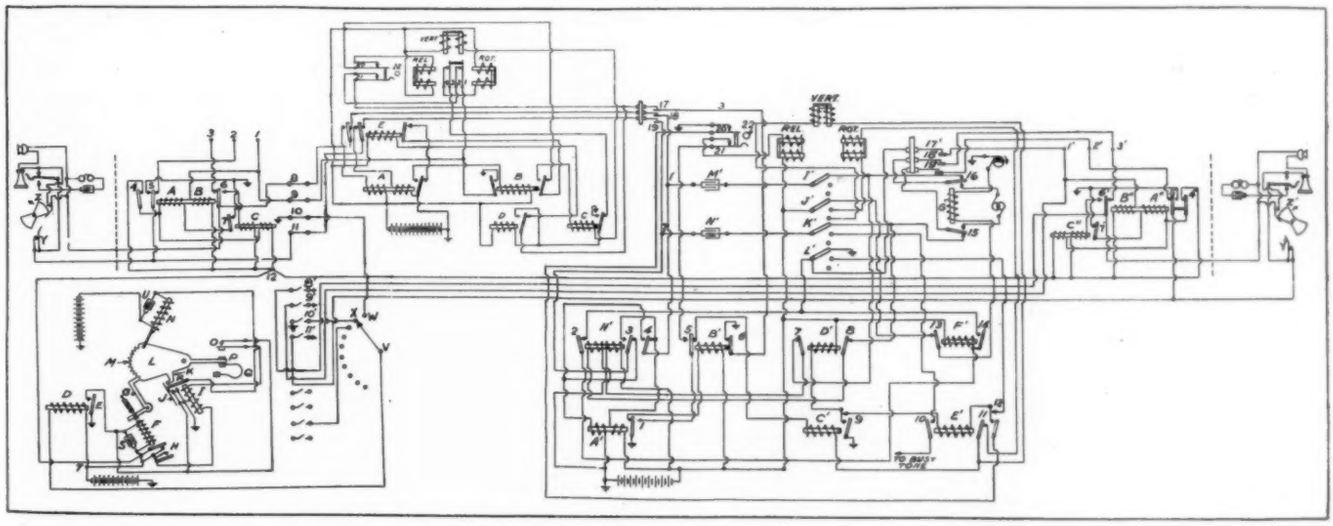


Fig. 297. Circuit Conditions Established in One Completed 3-Digit Single-Office.

Telephone Repeater Development

Research Work and Development of Successful Repeater—Essential Properties of Repeater Networks—Paper Presented at Joint Meeting of The A. I. E. E. and The Institute of Radio Engineers—Final Installment

By Bancroft Gherardi and Frank B. Jewett

The circuit over which transmission is given between the cities along the Eastern coast and the Pacific coast cities is shown diagrammatically in Fig. 42. Originally there were three repeaters used in this circuit, located at Pittsburgh, Omaha and Salt Lake City. Largely for flexibility in switching traffic, the number has been increased to six, located at Pittsburgh, Chicago, Omaha, Denver, Salt Lake City and Winnemucca. The total gains were only slightly increased by the change.

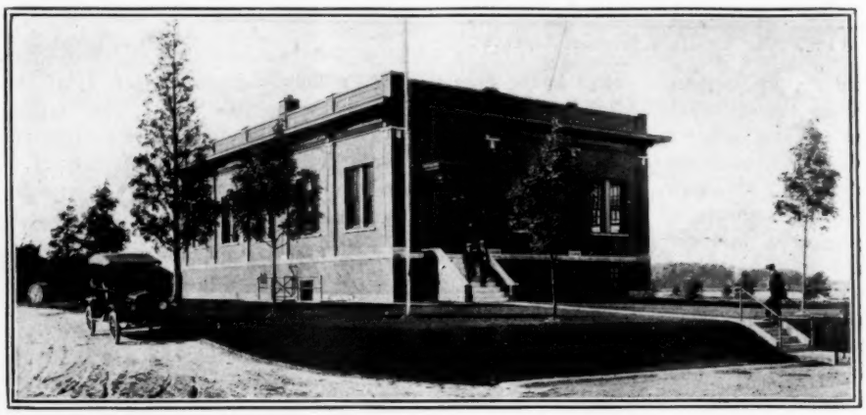


Fig. 43. Building Especially Erected at Princeton, N. J., for Repeater Operation in Which About 200 Repeaters Are Now Working.

The circuit consists of No. 8 B. W. G. copper conductors loaded at eight-mile intervals with coils of ¼ henry each. This gives a line equivalent of 56 miles of standard No. 19 gage cable. There is a further transmission loss due to composite and other apparatus of about 7 miles, the total equivalent being, therefore, about 63 miles. This is reduced by repeaters to a resultant equivalent of 21 miles, which is, therefore, about one-third of the equivalent without repeaters.

The drawing shows the important points on the line, indicates the positions of telephone and telegraph repeaters and indicates the compositing apparatus used in separating the telegraph and telephone currents.

The largest use of repeaters on cables has been in connection with the circuits between the various cities which are served through the underground cable route extending from Boston through Providence, Hartford, New Haven, New York, Philadelphia and Baltimore to Washington. The use of repeaters on small gage cables placed in this subway became of the greatest importance during the war in caring for the tremendously increased requirements for telephone facilities between these large cities along the Atlantic seaboard.

Most of these telephone repeaters are located in the large cities along the route of this cable. At two places, however, Princeton, N. J., and Elkton, Md., the repeater requirements were such as to justify the putting up of buildings especially for repeater operation. Fig. 43 shows an illustration of the building which was put up at Princeton. There are now about 200 repeaters working at Princeton. The ultimate capacity of the building will be over 500 repeaters.

Fig. 44 shows a typical group of repeater racks, each rack carrying two complete repeaters. Fig. 45 shows at the left front and back views of some of these repeater racks. At the right it shows the face of a test board from which the different repeaters and associated circuits may be tested. Fig. 46 shows the power board where the operating currents and potentials applied to the repeaters are measured.

The repeaters shown in these photographs are of the vacuum tube type. Fig. 47 shows a front view of an installation of the mechanical type repeaters at Providence, R. I. Fig. 48 shows a rear view of the repeater racks.

The longest cable circuits set up along this route are those from Boston to Washington, a total distance of about 455 miles. A typical layout for a circuit of this kind consists of loaded conductors, No. 10 B. & S. gage from Boston to New York, No. 13 gage from New York to Philadelphia and No. 10 gage from Philadelphia to Washington. This circuit has an equivalent of about 30 miles of No. 19 gage standard cable, which by means of repeaters located at Hartford, Conn., and Philadelphia, Pa.,

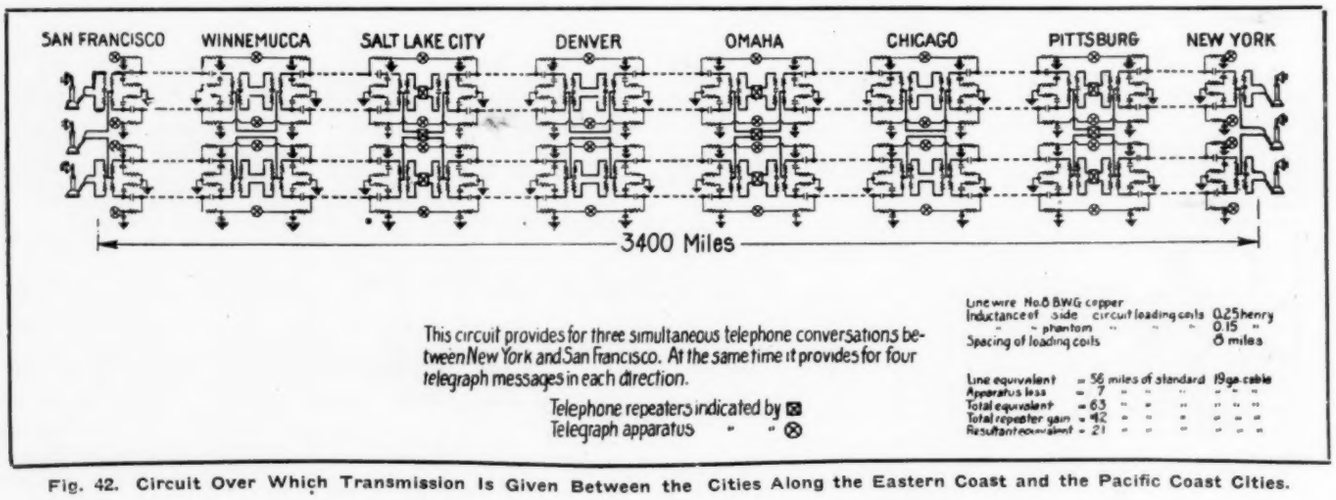

SAN FRANCISCO
WINNEMUCCA
SALT LAKE CITY
DENVER
OMAHA
CHICAGO
PITTSBURG
NEW YORK
3400 Miles
This circuit provides for three simultaneous telephone conversations between New York and San Francisco. At the same time it provides for four telegraph messages in each direction.
Telephone repeaters indicated by ⊠
Telegraph apparatus " " ⊗
Line wire No.8 BWG copper
Inductance of side circuit loading coils 0.25 henry
" " phantom " " " 0.15 "
Spacing of loading coils 8 miles
Line equivalent = 56 miles of standard 19ga cable
Apparatus loss = 7 " " " " "
Total equivalent = 63 " " " " "
Total repeater gain = 42 " " " " "
Resultant equivalent = 21 " " " " "

Fig. 42. Circuit Over Which Transmission Is Given Between the Cities Along the Eastern Coast and the Pacific Coast Cities.

is reduced to approximately 11.5 miles.

It should be noted here that No. 10 gage conductors are somewhat larger conductors than would now be placed for this business, and are being used because they were available, having been placed before the use of repeaters had been developed to their present effectiveness.

The longest circuits electrically—that is, those having the greatest attenuation—which have been operated with repeaters along this route, are New York-Washington circuits, consisting of No. 19 gage cable loaded with coils of about ¼ henry inductance, spaced at intervals of about 1.16 miles. The distance is about 225 miles. This gives a line equivalent of about 62 miles standard cable. By the use of four repeaters at Princeton, Philadelphia, Elkton, and Baltimore, the equivalent of this circuit is reduced to about 13 miles of standard cable.

These circuits make use of the 22-type repeaters. Where there is but one repeater in a circuit, however, the 21-type gives, under many conditions, satisfactory service. For example, between New York and Philadelphia, a distance of about 90 miles, a group of circuits is being worked on No. 19 gage conductors, with a single 21-type repeater at Princeton. The circuit without repeaters has an equivalent of about 24 miles of standard No. 19 gage cable. The repeater reduces this to about 14 miles.

In the foregoing we have endeavored to present a short history of telephone repeater development, a statement of the factors which control their successful operation, an idea of the possibilities and limitations of different types of repeaters and repeater circuits, and three or four typical examples of the present commercial line combinations in which telephone repeaters are vital links in the every-day telephone service of the public. This, we believe, will give a fair picture of the state of the art as it now exists, both technically and commercially.

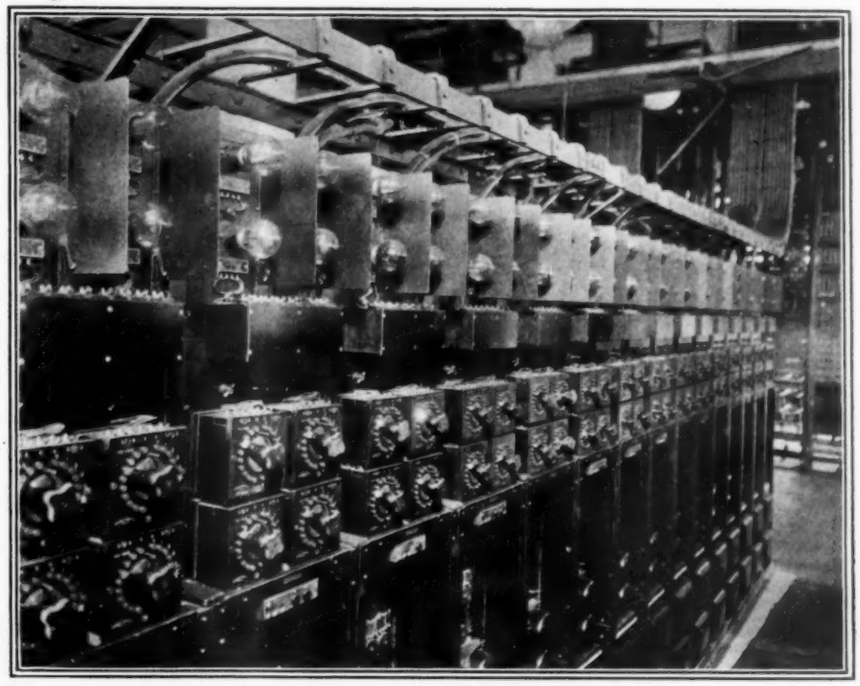


Fig. 44. Typical Group of Repeater Racks, Each Rack Carrying Two Complete Repeaters.

In concluding the paper it seems only necessary to add a word with regard to the further influence which the telephone repeater is likely to have on telephonic communication in the future.

As indicated in the earlier parts of the paper, the net result of the vast amount of work already done has been to produce amplifying devices capable of taking energy from a local source or sources and under the control of enfeebled telephonic currents from a distant transmitting station deliver back into the telephone line currents which are faithful reproductions of these enfeebled control currents but with many times their energy. Furthermore, the work already done has developed the methods which permit of utilizing the amplifying properties of these repeaters in the various kinds of telephone lines which go to make up the modern telephone network and methods of constructing and maintaining lines to secure maximum efficiency and economy from the use of repeaters.

The tools thus at our disposal are of such a character as to permit of our forecasting the changes which their use is likely to produce in the evolutionary growth of the telephone plant. When combined with the benefits to be derived from the loading of cable circuits, the use of the practically perfect repeaters now available puts an entirely different aspect on many of the problems which have confronted the telephone engineer in the past.

Not only will there be the opportunity to utilize smaller gage wires than has hitherto been possible but the economical field for underground and overhead toll cables will be greatly extended into the region which it has heretofore been possible to serve only with some form of open-wire construction. Viewed from

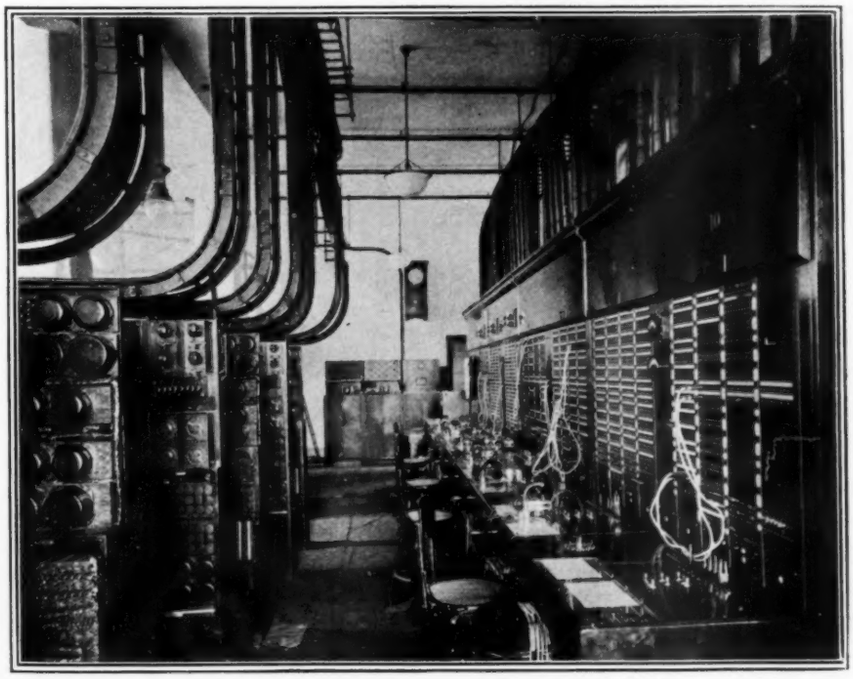


Fig. 45. To the Left May Be Seen Front and Rear Views of Repeater Racks and to the Right Test Board From Which Different Repeaters and Associated Circuits May Be Tested.

You Need Not Pay Operators at Outlying Exchanges --Install the C. A. X.

(Community Automatic Exchange)

MANY telephone companies are operating a number of exchanges, some of them serving only 50 or 100 subscribers.

But every manual switchboard, whether it serves 50 or 500 telephones, must have operators. Girls to fill these positions are hard to find and are demanding higher wages.

The Community Automatic Exchange (C. A. X.) has been developed especially to serve outlying exchanges.

No operators are required, all long distance and information calls being trunked direct to the operator at the main exchange. Quick, accurate service is given, 24 hours a day, Sundays and week days alike, at no extra expense to the company.

Maintenance is simple and costs less than operators' cord and dry cell renewals on old type systems. Common battery is used for talking, and 10 or more parties can be placed on a line.

Wherever installed the C. A. X. makes money for the company, and gives the subscribers service that pleases.

Let us tell you just what the C. A. X. can do for you.

AUTOMATIC ELECTRIC CO.

CHICAGO, ILL.

COLUMBUS OFFICE
120 Columbus Trust & Savings Bank Bldg.

FORT WAYNE OFFICE
502 Bass Block

the standpoint of continuity of service alone, this is an advantage of almost inestimable value. Further, the range of reliable and commercially possible long distance telephony will be very greatly extended.

Numerous fields which have in the past been fruitful regions of experimentation have likewise been made obsolete by the development of the telephone repeater. Most noteworthy of these is that looking to the production of powerful or so-called loud speaking transmitters.

Many investigators have in the past devoted much effort to the production of this type of equipment and for many years a large group of telephone engineers, notably those in Europe, looked upon the production of a practical loud speaking transmitter as a key to the solution of long distance telephony. Comprehensive studies by the engineers of the Bell system early convinced us that the solution did not lie in this direction and the success of the telephone repeater is a vindication of the adequacy of these early studies and of the consistent line of development which followed them.

In conclusion, the authors wish to express their appreciation to E. H. Colpitts, assistant chief engineer of the Western Electric Co.; O. B. Blackwell, transmission development engineer of the American Telephone & Telegraph Co.; A. B. Clark, of the American Telephone & Telegraph Co.; and H. E. Shreeve and John Mills of the Western Electric Co., for the very great help they have rendered in the selection from a mass of information of the data for this paper and for their assistance in its preparation.

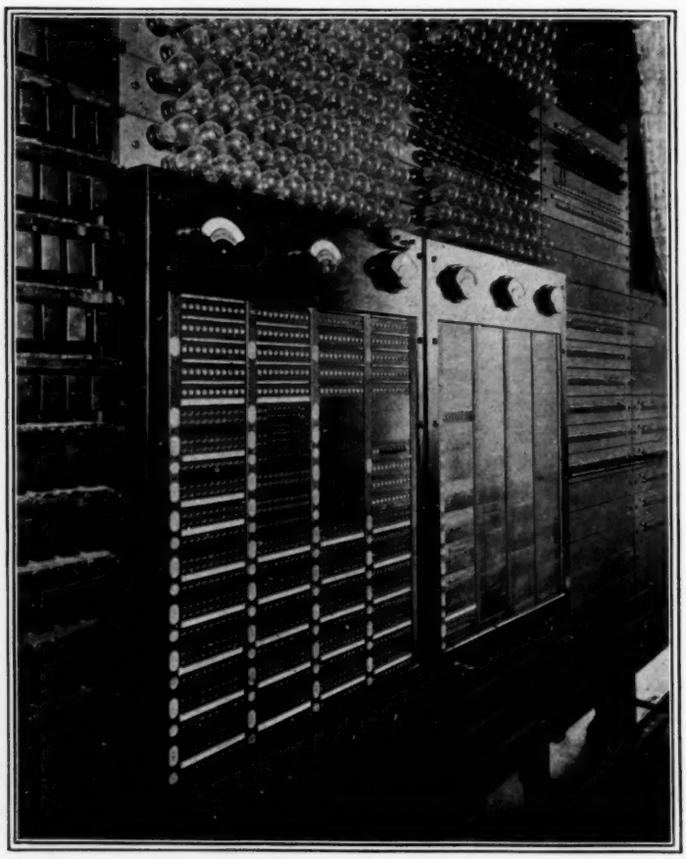


Fig. 46. Power Board Where the Operating Board and Potentials Applied to the Repeaters Are Measured.

Number of Telephones in San Francisco and Los Angeles.

San Francisco, Cal., had in service on August 1 of this year 138,310 telephones and Los Angeles, 128,705. The Pacific Telephone & Telegraph Co. operates in San Francisco while the Southern California Telephone Co. operates in Los Angeles. The latter company was organized about two years ago to take over and combine the systems of the Pacific and Home companies in Los Angeles.

New Centralized System for Making Pullman Reservations.

The telephone comes to the front in a new centralized system for the handling of Pullman reservations which is being installed by the New York Central lines.

Formerly the diagrams spent the day at the consolidated ticket offices of the United States railroad administration and at 5 p. m. were sent to the La Salle street station. After the new system is in operation both the ticket offices and the station will make reservations through the central Pullman reservation agent stationed somewhere in the heart of the La Salle street station — by telephone. Private lines will connect each ticket agent with the reservation agent's lair, to which the public will have no access.

Claire Hartigan, assistant traffic manager of the New York Central lines, said the system already was in operation in New York, Toledo and other eastern cities tapped by the road.

"It simply is a step forward," he explained. "Under the old system there were many diagrams of the same car—every ticket agent had one. Frequently some agent forgot to mark a section or a berth that was sold and some one else sold it over again at the last minute. This made for considerable confusion aboard the trains.

"Under the centralized system the man in the Pullman reservation office knows exactly how his space is placed."

Report of the Farmers' Telephone Company in Nebraska.

At the annual meeting recently of the stockholders of the Farmers' Telephone Co. of Dodge County, Neb., the three directors whose terms expired, C. L. Kelley, F. A. Howe and Lee Chapin, were re-elected.

Secretary Fowler read the following report of the company, which showed affairs to be in a prosperous condition:

Assets:	
Cash on hand	$ 3,870
Due from subscribers and agents	1,905
Accounts receivable	75
Material and supplies	2,521
Lands and buildings	12,370
Central office equipment	3,256
Station equipment	15,917
Exchange lines	65,233
Toll lines	595
General equipment	2,427
Taxes paid	403
Repairs of wire plant	1,654
Repairs of equipment	787
Station removals and changes	74
Depreciation of plant and equipment	4,840
Other maintenance expenses	1,098
Operators' wages	2,915
Other traffic expenses	505
General office salaries	2,673
Other general expenses	927
Total	$124,045
Liabilities:	
Capital stock	$22,885
Accrued liabilities not due	168
Depreciation reserve	46,618
Surplus	37,918
Exchange revenues	12,890
Installation revenues	495
Toll revenues	3,065
Miscellaneous revenues	6
Total	$124,045

New Telephone Company Organized at Minong, Wis.

The Alliance Telephone Co., of Minong, Wis., was organized recently to take over the Minong Telephone Co., the Bond Lake Telephone Co., the Nancy Lake Telephone Co. and the Farmers Mutual Telephone Co., and the following officers elected for the ensuing year:

President, A. A. Pietz; vice-president, R. A. Grimes; secretary and treasurer, L. E. O'Connell; L. M. Huyck and E. E. Swanson, directors, and I. B. Cartwright, manager.

The following temporary rates were

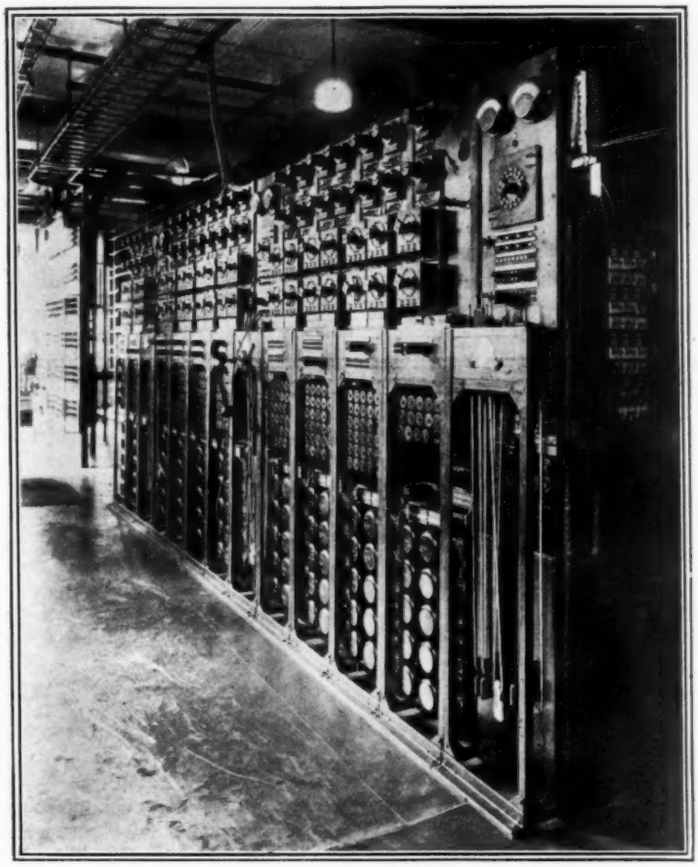


Fig. 47. Front View of Temporary Installation on 19 No. 22 Type Through Mechanical Telephone Repeaters and Associated Testing Units at Providence, R. I.

adopted with the consent and full co-operation of nearly every subscriber on the lines:

Individual line business, $2.25 per month.

Individual line residence, $1.75 per month.

Party line business, $1.75 per month.

Party line rural, $1.50 per month.

The company operates about 70 miles of line and has at present 130 subscribers and applications to bring it up to about 150 as soon as the connections can be made.

Manager Cartwright states that this is a new country and new settlers are coming in fast.

Two-Mile Cable to Vashon Island Opened for Service.

The new toll cable of the Pacific Telephone & Telegraph Co. from Tacoma, Wash., to Vashon Island was opened for service recently. The cable is 11,000 feet long, slightly more than two miles, and runs from the ferry landing at Point Defiance to the south end of Vashon.

It has nine-wire circuits, each wire insulated in paper and all of them encased in a lead sheath which is bound by 20 No. 6 steel wires, each as large as a lead pencil. The whole cable is 2¼ inches in diameter. It is laid 500 feet below the surface of the Sound.

While more than two weeks of preparation were needed for the laying, the actual work was done in 50 minutes, under the direction of J. F. Lowry, of Portland.

The cable was installed with a special cable scow owned by the telephone company, and two tugs. A great submarine reel was set up on the scow and 13,000 feet of the cable, all in one piece, which had been shipped on two reels on flat cars from the East, was rewrapped on the company's reel. This measures 24 feet through and weighs 14 tons. The cable itself weighed 35 tons and cost $22,000.

When everything was all set for the laying, the tugs were attached to the scow, the captain was given orders for full speed ahead and in 50 minutes the cable had been dropped to its resting place on the bottom of the Sound.

The cable is for use as a toll wire, the island company being an Independent company.

This new cable supersedes the one-line government cable that has been in use. It is the only multi-wire cable in use out of Tacoma.

Keeping the Service Fit.

Whether you dig the holes or climb the poles
To work among the wires,
Or wear the hooks or keep the books
Or use the handy pliers,
If you belong to the gang and savvy their slang
And try to do your bit,
We'll depend on you for what you can do
To keep the service fit.

You may test the bells or charge the cells,
Or work on the rack all day;
Be a cableman and splice on a "can"
Or clear the troubles away;
Whether you're "underground," or in the air to be found,
Or sit at a switchboard all day;
Whatever you do, we're depending on you
To see that the service is fit.

Cause of Action for Electrocution of Telephone Lineman.

In an action against a traction company and a telephone company for the death of the telephone company's employe, who was shocked while climbing a telephone pole carrying an uninsulated high-tension wire of the traction company, the complaint was held by the court to state a cause of action against the telephone company, as showing that the danger was the result of an act by the traction company that should have been foreseen or anticipated.—Independent Telephone Co. and Terre Haute I. & E. Traction Co. vs. Hickey; Appellate Court of Indiana; 124 Northeastern, 412.

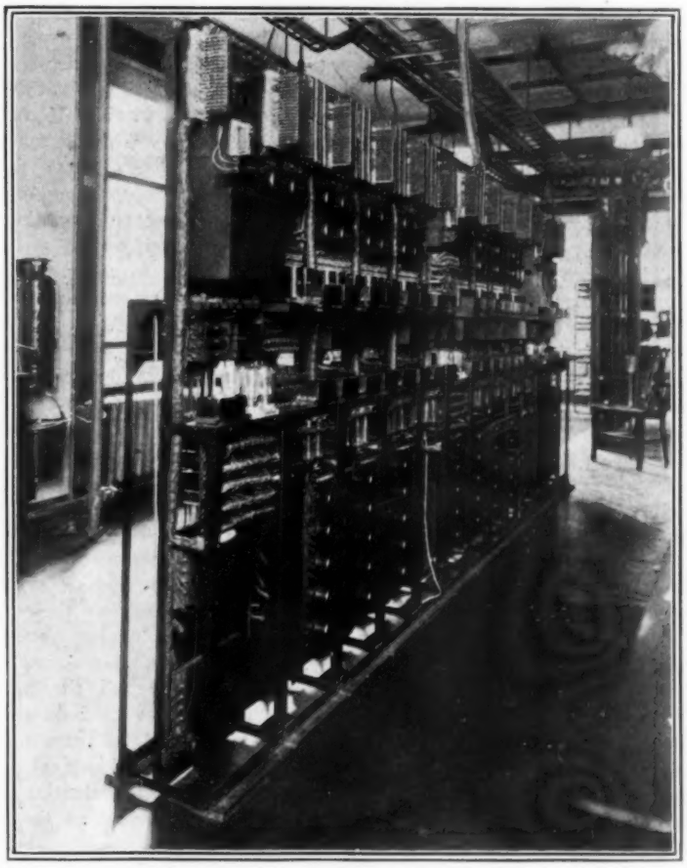


Fig. 48. Rear View of Temporary Installation of 19 No. 22 Type Testing Units at Providence, R. I.

MACHINE SWITCHING.

By Jay G. Mitchell.

(*Continued from page* 21.)

turns of rather coarse wire. This is so fixed *that the current normally passing* through the winding of the bridge cut-off relay and the release trunk will not operate it. It is obvious that the talking circuit from the private branch exchange to the central office will be incomplete at the normally-open contacts, 7 and 9, of relay *H* unless relay *H* has been operated.

1269. *The marginal feature.*—When it is desirable that a local line be given access to the central office for outgoing calls, the winding of its bridge cut-off relay is shunted with another resistance. This expedient reduces the resistance of the circuit traversed by the current passing through the winding of relay *H*, and it is made of such a value as to assure the operation of relay *H*.

At the same time, the normally-open contact, 8, of relay *H*, Fig. 303, is lightly adjusted so that the slight magnetic pull due to the current from a *non-shunted* bridge cut-off relay will be sufficient to close it. This can be easily done by care in adjustment and results in the calling local station receiving the busy signal each time that an effort is made to put a call through to the central office.

1270. *The holding coil.*—In the trunk impulse repeater circuit shown in Fig. 303 will be noted the inductive resistance coil *D*. This coil is short-circuited through the normally-open make-and-break contact, 5, of slow-acting relay *C* while the stream of switch-driving impulses is passing. The shunt around its terminals in removed when slow-acting relay *C* is released at the termination of the series of impulses and is left bridged across the trunk to central office.

A little reflection will show the need of such a device. Were no such path provided for the flow of current out over the trunk circuit after the double-wound line relay *A* becomes continuously energized, the line switch at the central office would be released and the connection lost.

The flow of current through the winding of *D* corresponds to the flow of current through the transmitter of the calling telephone in the case of an ordinary subscriber's line. The condensers, *M* and *N*, in the repeater prevent this flow of current from reaching the calling telephone, which, it will be remembered, is supplied with transmitter operating current through the windings of double-wound line relay *A*. (*To be continued.*)

Recognition of Appreciation in Value

Former Nebraska Railway Commissioner in Brief Filed with Commission in Pawnee City Rate Case Asserts That in Justice to Utility Investors Recognition Must Be Made of Appreciation in Value as Well as Depreciation

An attack upon the justness of the application of average unit cost prices and average lives of property in order to obtain the present value of a telephone plant, when a rate-fixing case is under consideration, is launched in vigorous style by Former Railway Commissioner Victor Wilson, in a brief filed with the Nebraska commission in the matter of the application of the Pawnee Telephone Co., of Pawnee City. Mr. Wilson also insists that state railway commissions, if they are to do exact justice to those who invest their money in public utilities, must recognize appreciation in value as well as depreciation.

These are points that are discussed at considerable length in the 20-page brief filed, the company making it plain that it does not desire to press for the full measure of its rights in the premises, but insists that the valuation upon which a return is to be allowed represent the amount of its capital contributions in the past, including sacrifices and deferred returns plus the bills payable outstanding and the additional capital it is in need of, $10,000. Minus the latter the total is $80,263.64. The authorized capital is $100,000, of which $66,750 is outstanding.

The discussion is one, however, that will interest telephone men generally, as it covers matters that are of growing importance in these days when the margin of safety has been narrowed by increased labor and material costs and the need of proper rates, those to which companies are entitled, is plainly manifest.

The company has asked for an increase in business rates from $2 to $3.25 net; two-party business from $1.50 to $2.75; residence from $1 and $1.25 to $1.75 and $2 per month. The hearing on the application has been delayed for a year because the commission insisted on replacement of a switchboard before it would hear the case.

The engineers' valuations were made almost without exception upon the basis of unit prices ascertained from a study of the costs of other plants contemporary as to time of construction in a general way with the applicant's plant. Very few were taken from the company's books, these being limited largely to the real estate and buildings and central office equipment.

Here, says Mr. Wilson, is a plant that shows by its records that the character is considerably above the average of plants built in so early a day, in that the highest grade and unusually large poles were used and were three times treated with carbolineum. The wire was of the best quality; cable has been put in place 50 per cent in advance of present needs; the building is fireproof, and the switchboard and central office equipment of the highest class.

The commission engineers then applied depreciation to their original cost construction figures on the basis of studies of other plants rather than upon the experience of the applicant. Fourteen years was used as the average life of poles and 25 years as the average life of galvanized iron wire. These are sacred figures with valuation engineers, yet Mr. Wilson says that the proof shows that poles that ought to be dead and buried, under the formula, are giving first-class service and wire that by that rule should be on a junk heap is carrying messages of company subscribers without complaint.

Here is a company with poles, 65 per cent of which are over 25 feet in length, which can be reset, and that have been in place for from 15 to 21 years in the city and from 9 to 17 in the country. But a very small number has been reset and no extensive resetting will be necessary for several years.

The average of the poles now in place is estimated at 12.6 years. Adding four years to this period before resetting is required gives 16.6 years, as representing 60 per cent of the life of the poles, the average life of poles remaining, the commission's chief engineer testified, at the time of the first resetting is about 40 per cent. Adding this, Mr. Wilson figures the entire life of these poles would be 27.67 years, which must be taken as a basis of depreciation.

The average of the wire corresponds to the age of the poles, and the average life may simply be said to be twice that of the poles. The engineers applied an average of 47½ per cent depreciation to the telephones, yet they are giving 100 per cent operating efficiency, the proof showing many had been rebuilt and worn out or defective parts replaced. Therefore, to apply average unit cost prices and average lives of property cannot be justified when not in conformity with the facts, is Mr. Wilson's contention.

Applying the percentages he says are proper, the property is worth $84,568.99, as compared with reproduction new of $100,933.60, and engineers' original cost

Creosoted Poles for Permanency—

The "*permanency*" demanded of wood poles is assured by proper creosoting treatment. Proper treatment * means the Open Tank process—hot and cold treatment—and insures thorough impregnation of the sapwood. Best results are assured by following the recommendations suggested herewith, and using Carbosota Creosote Oil.

**In this instance the reference is to cedar and chestnut poles.*

Recommendations for Butt Treatment of Cedar and Chestnut Poles by the Open Tank Process

CONDITION OF POLES. Poles should be seasoned until air-dry, and otherwise conform to standard specifications.

PREPARATION OF POLES. Of the surface to be creosoted, the area between a point one to two feet above, and a point 2 to 3 feet below the future ground line should be carefully cleaned of all adhering inner bark, or other foreign substance. Parts of the exterior surface showing soft or brashy wood should be shaved clean, until sound wood is exposed.

Barrett B Carbosota Grade-One Liquid Creosote Oil

TREATMENT. Pole-butts should be completely immersed in the preservative to a point two feet above the future ground line.

HOT TREATMENT. When treating tank has been charged, creosote oil should be admitted at a temperature of about 150 degrees F. and thereafter maintained at between 200 degrees F. and 220 degrees F. for the required period.

COLD TREATMENT. At the end of the "hot period" the cold creosote oil should be admitted until the temperature of the creosote drops a hundred degrees, whereupon the creosote oil and poles should be permitted to further cool to atmospheric temperature for the required period.

The level of oil in treating tank should be maintained uniform. Portion of pole being creosoted should not be exposed to atmosphere during treatment.

IMPREGNATION. The object of the treatment is to obtain complete impregnation of the sapwood. It should be required that the average visible penetration of the creosote oil should not be less than 50% of the depth of the sapwood ring.

Inspection should be by borings made with a Swedish increment borer, or similar instruments which recover an intact core of wood.

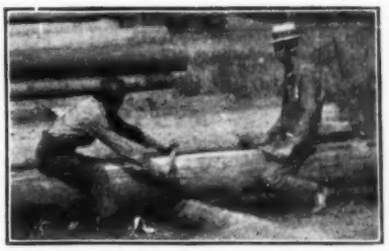
PRESERVATIVE. The preservative to be used should be a pure refined coal-tar creosote oil, meeting standard specifications. ("Carbosota Creosote Oil" is an identification mark—guaranteeing uniformity and efficiency.)

Green, or frozen poles should not be treated under these specifications.

TOPS, GAINS, ETC. Tops, gains and abrasions should be given a two-coat brush application of refined coal-tar creosote oil, heated to about 150 degrees F.

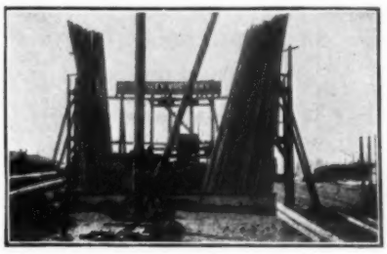
(Note.—Small plants can give treatment in accordance with these recommendations by maintaining the required period of hot treatment, and thereafter permitting both oil and poles to cool to atmospheric temperatures.)

Technical service, detailed recommendations, etc., for application of wood preservation obtainable gratis by addressing nearest office.

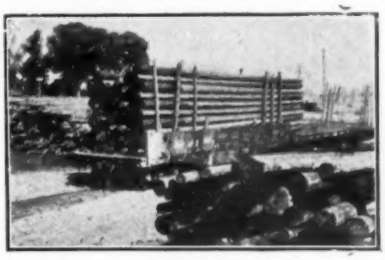


Shaving ground line area of pole before treatment

'Snaking' shaved pole to creosoting tanks

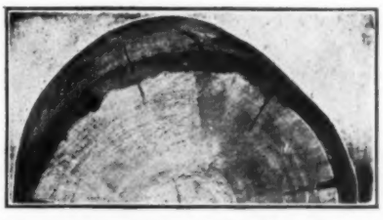


Creosoting poles by the Open Tank Process



Carload of butt-treated western red cedar poles leaving creosoting plant

Dipped, short-time treatment or surface treatment



Open Tank process (hot and cold treatments) Note thorough impregnation of sapwood

The Barrett Company

New York	Chicago			Philadelphia	Boston
St. Louis	Cleveland	Cincinnati	Pittsburgh	Detroit	New Orleans
Birmingham	Kansas City	Minneapolis	Nashville	Salt Lake City	Seattle
Peoria	Atlanta	Duluth	Dallas	Milwaukee	Bangor
Washington	Johnstown	Lebanon	Youngstown	Toledo	Columbus
Richmond	Latrobe	Bethlehem	Elizabeth	Buffalo	Baltimore

THE BARRETT COMPANY, Limited: Montreal Toronto Winnipeg Vancouver St. John, N. B. Halifax, N. S. Sydney, N. S.

values of $64,168.35 and depreciated value of $40,274.99.

In support of his declaration that a commission must also take into consideration all appreciation in the value of property devoted to public use where it can be established with reasonable definiteness and does not depend on generalizations or mere expressions of judgment, he cites the Minnesota rate case in the federal court.

In that case the court recognized appreciation in real estate as determined by the values of adjoining property, and also allowed appreciation in the remaining property measured by the cost of reproduction new less depreciation, holding that depreciation was confined to the cost of repairs and replacements necessary to make the property as good as new measured by its use, or in other words, operating efficiency.

Mr. Wilson contends that the rule laid down in that case was that the depreciation to be considered is not that which has been overcome by repairs and replacements, but is the actual, existing depreciation in the plant as compared with a new one.

The court is quoted as saying that "it would seem to be inevitable that in many parts of the plant there should be such depreciation, as for example, in old structures and equipment remaining on hand, and when an estimate of value is made on the basis of reproduction new the extent of existing depreciation should be shown and deducted. If there are items entering into the estimate of cost which should be credited with appreciation, this also should appear, so that instead of a broad comparison, there should be specific findings showing the items which enter into the account of physical valuation on both sides."

Following a ruling on an Idaho case against the public utilities commission, Mr. Wilson contends that so far as the question of depreciation is concerned, deductions should be made only for actual, tangible depreciation, and that what is called accrued depreciation, a purely theoretical proposition, does not govern. In other words, that if it be demonstrated that the plant is in good operating condition and giving as good service as a new plant, then the question of depreciation may be entirely disregarded.

The company's revenues for the first nine months of the year were $15,254.28, and that after deducting operating expenses, maintenance and depreciation and taxes, there was an actual deficit of $1.68, without including any return for the use of the property. The new rates, it is figured, will total $22,059, coming within a hundred dollars of all expenses, including interest and 8 per cent dividends on $76,750 of stock.

Commissions, Courts and Councils

Discussions and Rulings of State Bodies Having Supervision Over Telephone Companies—Decisions of Courts in Matters of Interest to Public Utilities and Actions of City Councils Relative to Franchise, Rates and Service

Texas Welfare Commission to Conduct Additional Hearings.

The Industrial Welfare Committee of Texas, which is investigating the wages paid female employes and minors, with a view of arriving at a fair and just minimum wage, is arranging to hold a hearing at Wichita Falls, Texas. This hearing is scheduled to be held before the commission has its general hearing in the city of Austin.

It is probable that the Wichita Falls hearing will be held early this year and there is a chance of the general meeting at Austin being postponed until February instead of holding it this month as formerly announced.

The State Department of Labor of Texas has made various investigations as to the cost of living for working girls and will soon make a report to the Industrial Welfare Committee, which will set forth the facts that it would require $643 for a working girl to have the bare necessities for a year and that to enable such a girl to live comfortably as she should it would require $1,044.

A budget has been compiled by Miss Edythe P. Hershey, extension lecturer on home economics of the University of Texas, showing what a self-supporting woman in Texas requires to live decently under the present conditions.

Miss Hershey estimates that it would take $16.50 per week for a woman to be self-supporting, and divides her budget as follows: $30 a month for board, $192.35 per year for clothing, 60 cents a week for car fare, 75 cents per week for laundry, 50 cents a week for recreation and periodicals, $45 a year for life insurance, $15 a year for medical attention, $50 a year for donations and vacations and miscellaneous items and $1.95 a week for savings.

The only provision against sickness and unemployment, according to Miss Hershey's budget, is the savings allowance of $1.95 per week.

Miss Hershey contends that the clothes' allowance should enable a woman to dress in a neat shirtwaist and skirt with one full dress a year.

Burleson Exchange Rates to Continue at Sherman, Texas.

The telephone rates established at Sherman, Texas, by the Postmaster General during the period of federal control will continue in effect, the city council having granted the Grayson Telephone Co. permission to continue those rates.

Under this schedule the business rate is $1.50 and the residence rate, $2.25 per month.

Telephone Rates Increased at Jasper and Hardwick, Minn.

The South Dakota Rural Telephone Co. is given permission by the Minnesota Railroad & Warehouse Commission, in an order dated December 19, to establish and collect at its exchanges in Jasper and Hardwick, Minn., the following schedule of rates:

Individual line business, $2.75 per month gross.

Two-party line business, $2.25 per month gross.

Individual line residence, $1.75 per month gross.

Four-party line residence, $1.50 per month gross.

Rural multi-party (exclusive business) metallic lines, $2.25 per month gross.

Rural multi-party residence, $1.50 per month gross.

Rural switching, $4.20 per year gross.

A discount of 25 cents per month is to be allowed on all gross rates if the bill is paid on or before the last day of the month in which the service is rendered, except that rural multi-party rates are payable quarterly in advance, with a discount of 75 cents if paid on or before the last day of the first month of the quarter, 50 cents if paid on or before the last day of the second month of the quarter and 25 cents if paid on or before the last day of the third month of the quarter.

All the rates petitioned for were granted with the exception of that for rural multi-party residence telephones which was reduced from $1.75 to $1.50 and the rate for rural switching, a net rate of $4.20 per year being allowed in place of $5 per year as requested by the company.

Hearing in this matter was held December 3 at Jasper and Hardwick, Theo. Helien, manager, appearing in behalf of the petitioner.

The South Dakota Rural Telephone Co. is a corporation organized in 1905, and operates telephone exchanges at Jasper and Hardwick, Minn., serving 176 village and 285 rural telephones at Jasper, and 53 village and 145 rural telephones, and performs switching for 11 other rural telephones at Hardwick.

A CABLE TERMINAL

that will give Relief from Fuse Contact and Carbon Troubles

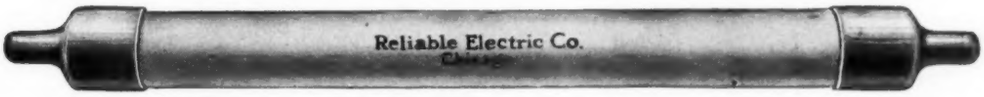
Cable Compartment Air Tight

A 27-Cable Terminal

P 495

Equipped with Self Cleaning Discharge Blocks when specified.

Fuse Clips That Bite Through Corrosion to the Clean Metal



No. 27 Fuse—Full Size

A. Contact points bite into fuse ends insuring good contact even if fuse end is corroded.
B. Cable soldering terminal is formed deep into slot to prevent turning.
C. Screw is soldered to cable wire terminal to insure perfect contact.
D. Fuse clips are readily removable.
E. Lock nut binding post for attaching drop wires.
F. Projection on fuse clip fits into groove to prevent turning.

Protect your telephone service as well as your employees and property.

Reliable Electric Company

411 South Sangamon St., Chicago, U. S. A.

Exhibits covering the operations of the company were submitted for the years 1917, 1918 and the first seven months of 1919, together with an inventory and appraisel of the telephone properties. These exhibits have been carefully checked and duly considered.

The evidence reflects incorrect classification of various expense items, in that, several of the expense accounts are carrying more than is properly chargeable and other accounts carrying correspondingly less.

Upon review of the facts, the commission finds that the evidence is not sufficient to warrant it in approving the rates petitioned for and that the schedule of rates, as previously quoted, is fair and reasonable and will yield sufficient revenue to provide for the necessary operating expenses, depreciation and a fair return upon the investment.

Increase in Rural Telephone Rate at St. Cloud, Minn.

The petition of the St. Augusta Rural Telephone Co. for permission to increase its rate for rural telephone service at St. Cloud, Minn., from $1 to $1.75 per month is granted by the Minnesota Railroad & Warehouse Commission in an order issued December 20. The new rate is payable quarterly in advance, with a discount allowance of 75 cents if payment is made during the first month, 50 cents the second month, and 25 cents the third month.

Pursuant to notice, hearing on this petition was held on November 28, at St Cloud, Henry Hess, secretary, appeared for the telephone company.

The St. Augusta Rural Telephone Co. operates rural lines exclusively, serving approximately 106 stations in the townships of St. Cloud, St. Augusta, Linden and Fairhaven, Stearns county, Minn. Metallic circuit construction is used and the territory is well developed.

Exhibits covering the operations of the company for the years of 1917-1918 and nine months of 1919 were submitted. The exhibits show an economical operation of the system. The revenues have not been sufficient, however, to properly maintain the lines and equipment or to set up a depreciation reserve to protect the property and the subscriber's future service.

Upon review of the evidence, the commission finds that the rate petitioned for is fair and reasonable and will not yield more than sufficient revenue to provide for the necessary operating expenses, depreciation, and a fair return upon the investment. It is, therefore, ordered placed into effect as of January 1, 1920.

Local and Rural Rates at Kiester, Minn., Increased.

The Minnesota Railroad & Warehouse Commission on November 20 granted permission to Oscar Johnson, proprietor and sole owner of the Kiester Telephone Co., which serves about 400 stations in the village of Kiester and rural territory adiacent thereto, to place into effect December 1 the following schedule of increased rates:

Individual line, business, $2.50 per month gross.
Individual line, residence, $1.75 per month gross.
Extension stations, 50 cents per month net.
Rural multi-party (company owned), $1.50 per month gross.
Rural multi-party (not owned), 35 cents per month net.

These rates are subject to the usual discount of 25 cents per month for payment in advance, exchange rates being due and payable during the month in which service is rendered and the rural rates being payable quarterly in advance.

The rates in effect at the present time are as follows:

Individual line, business, $1.50 per month gross.
Individual line, residence, $1.25 per month gross.
Extension station, 50 cents per month net.
Rural multi-party (company owned), $1.25 per month gross.
Rural multi-party (not owned), 25 cents per month net.

Hearing in this matter was held November 13 at Kiester. Oscar Johnson, proprietor, and Mrs. Oscar Johnson, bookkeeper, appeared for the telephone company. P. A. Peterson, S. S. Ozmun, Louis Heetzick and H. W. Emerson, subscribers of the company, were also present, but no protests to the application were entered.

Exhibits covering the operations of the company were submitted for the years 1917-1918 and first eight months of 1919, together with an inventory and appraisal of the property. While the records indicate that some of the expense items are incorrectly carried in the various accounts, the evidence shows the business to be economically conducted.

The commission is now investigating the cost of rural line switching, and denies, without prejudice, the petitioner's application for a rate of 50 cents per month for such service, and authorizes a rate of 35 cents per month.

Social Telephone Co. of South Dakota Gets Rate Increase.

The Social Telephone Co. is given permission by the South Dakota Railroad Commission to put into effect at its exchanges at Britton, Claremont, Havanna, Hecla, Kidder and Newark after January 1, 1920, the following schedule of rates:

Business, main line, per month	$2.00
Business, party line, per month	1.50
Residence, main line, per month	2.00
Residence, party line, per month	1.50
Rural, party line, per month	1.50
Desk sets extra	.25
Extension bells	.25

The company is authorized to bill all its subscribers in an amount 25 cents per month in excess of the net rates quoted, from which a discount of 25 cents per month per telephone shall be granted for advance payment.

The company is ordered and required by the commission to adopt a higher standard of maintenance and to make such replacements at the earliest opportunity as may be needed to put the plant in efficient condition and to report to the commission monthly the amounts expended in making replacement or improvements.

The commission also orders the company to adopt and put into use its uniform system of accounts and to set aside not less than 6 nor more than 7 per cent of the value of the plant to take care of depreciation.

The practice of charging and collecting from its stockholder subscribers a lesser or different rate from that which it charges and collects from its non-stockholding subscribers is ordered by the commission to be discontinued.

At the hearing in this case at Britton the company was represented by E. O. Jones and D. G. Stokes, its secretary and president, respectively.

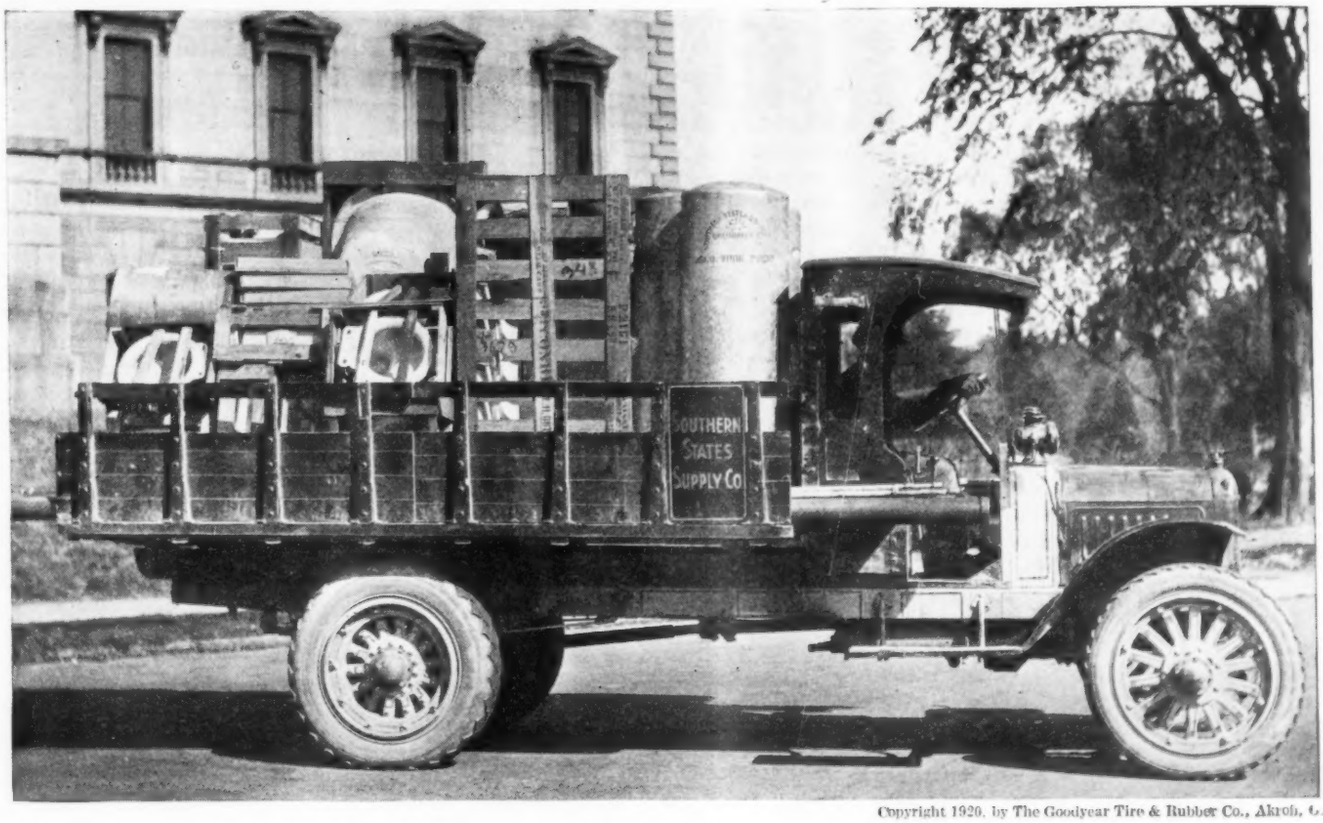
The board is of the opinion and finds that for the purposes of this case the fair value of the telephone plant of the applicant used and useful in the conduct of telephone business and devoted to the public service is $9,040.

Allowing 7 per cent for depreciation, the commission estimated that the proposed rates would yield a return of but 4.79 per cent upon the investment, which, it believes, is not excessive and should be approved.

The company furnishes service to nearly 800 subscribers, approximately half of whom are stockholders. It operates six exchanges in South Dakota and an exchange at Cogswell, N. D., and furnishes service to several hundred farm line subscribers in the general territory tributary to the towns in which it operates exchanges; that no classification of its service has ever been made and that subscribers have been furnished service at a rate of $1.25 per month without any regard for the purpose for which the telephone instrument might have been installed and irrespective of whether main line or party line service was being furnished.

The commission was asked to classify the company's service as between business and residence and rural and to establish reasonable rates for each class, as well as reasonable rates for party line service as distinguished from main line service.

The records of the company have been very poorly kept and no information of value was to be obtained therefrom. The records do show, however, that the cost



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of operating and maintaining the property has increased very rapidly in recent years and that the company will be unable to continue operation under the present rates.

At Britton and Hecla there is a duplication of exchange facilities, the Dakota Central Telephone Co. operating exchanges in competition with the Social Telephone Co. at those points. Competition between the companies has been very intense, with the result that the Dakota Central exchange in Britton is very small, while at Hecla the latter's exchange is as large or larger than that of the Social Telephone Co.

The commission suggests that if a division of business can be made, the telephone service in that general territory will be improved and the revenues of the Social Telephone Co. will be increased at least to the extent of the amount of terminal fees received for the handling of toll business.

Eden Valley (Minn.) Telephone Co. Gets Higher Rates.

The Eden Valley Telephone Co. is given permission by the Minnesota Railroad & Warehouse Commission, in an order handed down November 25, to increase its local and rural rates in Eden Valley and the rural district tributary thereto from $1.75 per month for business service and $1 for all other classes of service to the following schedule:

Individual line business, per month gross	$2.50
Extension station business, per month net	.75
Individual line residence, per month gross	1.75
Two-party line residence, per month gross	1.50
Extension station residence, per month net	.50
Rural multi-party (company owned), per month gross	1.75
Extension bells, per month net	.25

A discount of 25 cents per month is to be allowed on all gross exchange rates if bills are paid on or before the 15th of the month in which the service is rendered. Rural rates are payable quarterly in advance, with a discount of 75 cents if paid on or before the 15th day of the first month of the quarter; 50 cents if paid on or before the 15th day of the second month of the quarter, and 25 cents if paid on or before the 15th day of the third month of the quarter, in which the service is rendered.

Hearing in this case was held at Eden Valley on October 22, the following appearances being made for the petitioner: E. E. Welch, secretary-manager; S. J. McCarthy, treasurer; F. C. Mier, vice-president; M. A. Weiler, R. F. O'Brien and C. M. McIntyre, directors. No protests were entered in objection to the application.

Exhibits covering the operations of the company were submitted for the years 1917-1918 and the first nine months of 1919, together with inventory and sketch of rural line construction. Each and all of these exhibits were carefully checked and duly considered by the commission.

The evidence reflects incorrect classification of various expense items, in that, while total cost of operation shows that business has been economically conducted, several of the expense accounts are carrying more than is properly chargeable and other accounts carrying correspondingly less.

The petitioner asked for authority to apply a penalty on deferred payments on residence and rural service. The commission states, in its opinion, that it does not look favorably upon a regulation of this nature, but approves of the addition of a reasonable amount to the net rate for each class of service, to be applied as a discount for prompt payment.

Nebraska Company Head Under Fire Before Commission.

C. J. Garlow, one of the best known telephone men in Nebraska, and for a number of years president of the state association, was under fire for a whole day before the state railway commission recently. Mr. Garlow was at the commission's offices in Lincoln asking for an increase in rates for his company, the Platte County, which serves the important city of Columbus. He was also there under an order to show cause why he should not cease to collect certain charges he had been making for service connections and for re-connections.

The city of Columbus sent down its city attorney, Louis Lightner, to oppose him, while C. N. McElfresh appeared as pro bono publico. An all day battle followed.

The attorneys said that when Mr. Garlow charged $200 a month for his service as president he was placing an undue burden on the plant, inasmuch as he is also a successful and busy lawyer. Mr. Garlow replied by a recitation of all that he did for the company as actual manager. They also challenged the employment of his daughter as bookkeeper. He said she was worth more than he paid her, and remained largely out of loyalty, receiving but $85 a month.

Mr. Garlow sprung on the commission an order of that body, issued in 1916, which permitted him to charge $1 for reconnections. He has been charging $1.50. In answer to the charge that he had been compelling new subscribers to pay for materials used in bringing service to them, he showed that the commission had allowed other companies to do so and that the charge was made, not for revenue purposes, but to check the extension of telephone facilities during the war, when men and material were needed to win the great conflict. This charge was in addition to the Burleson schedule.

Mr. Garlow showed that while he has been furnishing service for $3 a month for Columbus, other cities of the same size have been paying other companies from $3.25 to $4 a month. He said that no other company located in as large a city had so low a rate. He furnished a large number of exhibits of operations and agreed to submit others asked for.

The case was submitted on briefs, each side being given opportunity to peruse the other's claims and then answer them by the same route.

Hearing in Nebraska on Burleson Toll Rate Schedule.

Only four other companies besides the Lincoln and Nebraska companies appeared at the recent hearing before the state railway commission on the order to show cause why the Burleson toll rate schedule should not be eliminated. These were the Platte Valley, represented by Charles Milliger; the Milburn & Anselmo company, by H. K. Atkisson, manager; the Martell company, by A. E. Golz, president, and the Pawnee by G. E. Becker, secretary.

The Nebraska company was represented by Guy H. Pratt, head of the commercial department and E. M. Morsman, Jr., attorney, and the Lincoln company, by Frank H. Woods, president, and L. E. Hurtz, general manager.

All of the telephone men present were heartily in favor of the continuation of the Burleson schedule as it had later been modified. The general basis of their support of it was that nationalized rules made for better standards and service.

Representatives of the Bell company said that the Burleson schedule, with its varying charges, had meant less revenue to the company during the time of its operation. They submitted some studies which showed that the company received an average of one cent less per message than under the schedule formerly prevailing.

There was lacking, however, in this study the element of measurement of the length of the call. It covered only the number and the amount paid, but not the average length. The company reported that the station-to-station business had increased, but this was largely due to the fact that it was being pushed.

The Lincoln company representatives held it in high favor, but not for use, as they put it. They had sent a copy of the schedule to each subscriber, summarized in a four page small-sized booklet, and a reduced revenue had resulted. They said they were rather between the devil and the deep sea. They needed more revenue and could not afford to push the proposition.

Commissioner Brown suggested as a better form of advertising a more condensed summarization printed on a card that could be inserted in the envelope with each bill sent out.

Both of the companies reported a great

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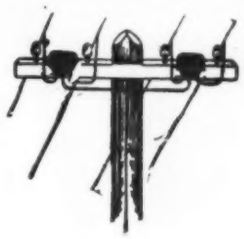
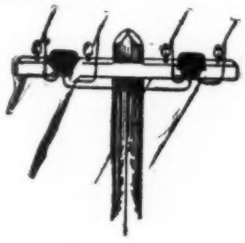


In 1919 old friends liberally increased their equipment while new users flocked to the colors.



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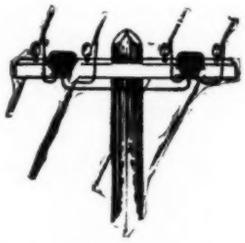

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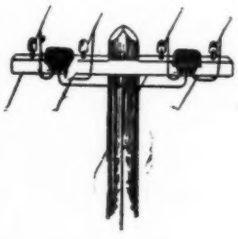

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deal of evasion of payment of tolls under the old method, where no charge was made when the party desired did not respond. Many big users had developed a number of systems of codes by which they could obtain the information they desired without paying a cent for the service. Big jobbers who daily call customers avoided payment of tolls by having it arranged with the customer that if he did not desire anything to refuse to answer or have it reported that he was out.

The biggest scheme, however, was that worked by houses with field men and branch house agencies. These men ordinarily make frequent calls, many of them daily, in order to ascertain the trend of the market. In order to avoid any toll payments the operator would be told that the man called for had gone north, which meant the markets were up, or south, which meant that they were down. Other directions gave other information.

The attention of the commercial department was called to the matter by the big loss in revenues from houses that had formerly paid large toll bills monthly and also because of the large number of cancelled calls. They investigated, discovered the system, and then instructed the operators to give a different direction to the peregrinations of the party asked for.

The result was that a number of firm representatives "got in bad" by pushing sales at the wrong time, and one firm threatened a suit for damages because of the failure to repeat the reply exactly, but it ended with a threat.

Traveling men had also devised a system of letting their wives know when they were coming home by putting in a call that they desired to talk to her at a certain hour, and then not being there. She knew from the hour stated when to expect her hubby.

No decision has yet been given by the commission.

Asks Continuance of Emergency Rates in Nebraska.

Two days were recently spent by the Nebraska State Railway Commission in hearing the application of the Lincoln Telephone & Telegraph Co. for continuance of the present exchange rates, collected under an emergency order that is soon to expire.

The company submitted figures showing that it now has liabilities, balanced by assets, of nearly $9,000,000. These are represented by a capital stock issue of $6,176,000, bonds of $1,200,000; depreciation reserve, $830,205; bills payable, $373,924 and surplus of $512,170. It has a physical plant valued at $8,152,027.

For the 11 months of 1919, ending November 30th, the company presented its financial statement showing total revenues of $1,873,677, total expenses, $1,500,981, and net earnings of $372,696. Adding sundry earnings brought the total net earnings up to $396,374, which were distributed as follows: Interest, $64,943; dividends, $319,073; surplus, $12,355.

The revenues of the company increased an average of 23.08 per cent, made up of 22 per cent on exchange revenues and 25 on toll, while the expenses increased 24.61 per cent, made up of operation, 31.35 per cent, maintenance, 31 per cent, depreciation, 20.55, taxes 9.28.

The company now operates 114 exchanges and 61,396 stations. The connecting stations number 26,891, a total of 88,287. The net gain for the period was 1,205 stations.

In the emergency order under which the company has been operating for five months, it was provided that no greater dividend should be paid on the common stock than had been paid in the last five years. This was 7 per cent. Representatives of the company made a strong plea for the removal of this limit.

Mr. Hurtz said that heretofore the company has been able to find a local market for its common stock, which issue is in excess of $2,000,000. It is now faced with a rebuilding and new construction budget calling for the expenditure of $1,600,000 during 1920. It must go outside for a market for this stock, and under present conditions it cannot sell a limited 7 per cent stock for par, but must do so at a discount that makes it practically an 8 per cent security.

The company objects to selling the new stock at a discount. What it desired was that the commission remove the limitation so that it may pay whatever dividend it may be able to earn, and thus make the stock attractive.

Questioning by the commission brought out that the Bell company, which holds about $4,000,000 of a special preferred issue, given it seven years ago when the Lincoln purchased its property in the South Platte section, has a contract by which if a higher dividend than 7 per cent is paid on the common stock, this special stock shall also receive a proportionate increase. Thus if common paid 8 per cent the special preferred would get $40,000 more, or 6 per cent, which would mean a total dividend increase of $60,000.

Summary of Commission Rulings and Schedule of Hearings.

FLORIDA.

December 23: The commission authorized the Cocoanut Grove Public Utilities Co. to increase its rates for service in Cocoanut Grove and vicinity as an emergency measure, pending a thorough investigation into the company's affairs.

INDIANA.

December 31: Hearing on the application of the Peoples Telephone Co., of Bryant, for an increase in rates.

January 6: Hearing on the petition of the Home Telephone Co., of Portland, for a modification of the commission's recent order fixing rates in Portland.

MICHIGAN.

January 29: Continued hearing in the matter of the special contracts between the Michigan State Telephone Co. and the Citizens Telephone Co., of Grand Rapids, and their respective subscribers.

NEBRASKA.

December 20: In the matter of the application of the Odell Telephone Co. for permission to issue stock to the amount of $5,000 to pay the costs of consolidation with the Farmers' Mutual Telephone Co., hearing had, submitted on the record and taken under advisement; appearances, J. R. Renard, president; W. F. Stanoschek, secretary, and J. E. Murphy, treasurer.

December 22: Application of the Wellfleet Telephone Association for authority to increase rates, filed.

December 22: Application of the Wellfleet Telephone Association for validation of stock issued without authority and under a misapprehension, filed.

December 22: In the matter of the application of the Lincoln Telephone & Telegraph Co. for authority to continue in effect the present exchange rates, authorized under an emergency order soon to expire, completion of testimony, submitted on record and taken under advisement. No protestants appeared.

December 22: Application of the Nebraska Telephone Co. for elimination of toll station at Enola, filed.

December 22: Application of the Milburn & Anselmo Telephone Co. for permission to increase toll rates, filed.

December 23: Application of the Tri-County Telephone Co., of Stapleton, for authority to publish an increased schedule of rates, filed.

December 24: Application of the Ansley Telephone Co. for permission to increase rates, filed.

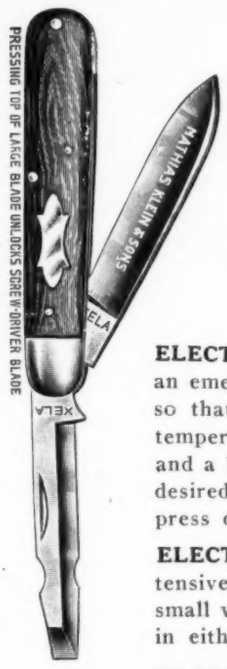
December 24: Application of the Shell Creek Mutual Telephone Co., of Petersburg, for permission to increase rates, filed.

December 24: Order issued granting the application of the Nebraska Telephone Co. for permission to issue $1,800,000 of new stock. The company recently increased its capital stock from $10,000,000 to $15,000,000. It secures practically all of its new capital for construction work from the American Telephone & Telegraph Co., which owns almost all of its capital stock, and the commission found that it now owes that company $6,472,500. This plan of borrowing, instead of issuing stock, is found to work better for the reason that the money can be borrowed as wanted, in sums as small as $25,000, and thus interest is saved. The stock authorized will retire 6 per cent notes of that amount. The company owed, according to the record, $4,000,000 to the A. T. & T. in 1914.

December 24: Hearing in the matter of the application of the Skeedee Telephone Co. for an increase in rates at St. Edward. Appearances for the company, E. S. Collins, secretary; no protestants appeared. The company was given permission to amend its application to include a rate of 25 cents a month per quarter mile for individual service outside exchange limits; submitted on evidence and taken under advisement.

December 30: Hearing held at Blue Springs on the application of the Gage County Telephone Co. for an increase of rates.

January 8: Hearing in the matter of the application of the Union Telephone



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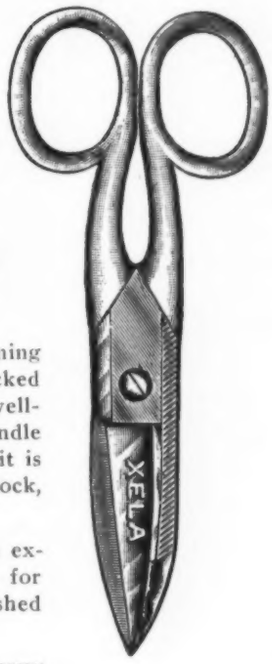

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NEW YORK.

January 8: Hearing on investigation into the rates charged by the New York Telephone Co. in the city of Buffalo.

OHIO.

December 12: Joint application filed by the Sandusky Home Telephone Co. and the Central Union Telephone Co. for an order authorizing the former to sell and the latter to purchase the Home company plants in Sandusky, Castalia and Bloomingville.

January 8: Continued hearing in the matter of the complaint of the city of Cleveland as to the service and rates of the Cleveland Telephone Co.

OKLAHOMA.

February 20: Further hearing in the matter of the investigation into the service and rates of the Southwestern Bell Telephone Co., originally set for December 17, postponed to this date.

OREGON.

December 22: Hearing at Philomath on the application of the Philomath Telephone Co. for an increase in rates in that city.

PENNSYLVANIA.

December 12: New schedule of rates filed by the Ralston (Pa.) Telephone & Telegraph Co., effective January 1, 1920. The private line residence rate is increased from $15 to $20 per year; private line business from $24 to $30 per year; rate for two telephones to same subscriber, from $30 to $40. A charge of $3 is made for moving and installing telephones.

SOUTH DAKOTA.

December 23: The commission granted permission to the White (S. D.) Telephone Co. to collect the following rates which are subject to the usual 25-cent monthly discount for prompt payment: Main line business, $2.25 per month; main line residence, $1.75; party line residence, $1.50; rural telephones, $1.65. No. 3719.

VIRGINIA.

December 17: Continued hearing on the application of the Chesapeake & Potomac Telephone Co. for permission to increase rates at its exchanges throughout the state.

WISCONSIN.

December 22: Order issued authorizing the Hollandale Telephone Co. to increase its rates. This company is owned by a Mrs. Lizzie Morgan and renders service to 11 single party business subscribers and 11 single party residence subscribers on lines owned by Hollandale Telephone Co. and to 161 subscribers on lines owned by other companies. The increase authorized is from $1.50 to $2 for business telephones; $1 to $1.50 for residence, and from $.25 to $.60 per month for telephones on switched lines.

December 22: Order issued authorizing the Cady Telephone Co. to increase its rates for telephone service to $4.50 net per quarter per telephone.

December 22: Order issued authorizing the Stockbridge & Sherwood Telephone Co., with exchanges at Stockbridge and Sherwood, to increase its rates for business, residence and rural service. The company switches part of its subscribers at the Hilbert exchange of the Eastern Wisconsin Telephone Co. The book value of the plant is placed by the company at $11,150.52, which is considerably less than the estimated cost of reproduction. The total amount demanded on revenue, after considering the minimum wage order requirements, is $6,742. The commission recommends that the company abolish free toll service and make a charge of five cents for three minutes to subscribers between exchanges.

December 22: In an order granting authority to the Ontario & Wilton Telephone Co. to increase its rates, the commission refused to consider an increase in salary for the non-resident manager as necessary at this time, and suggested a less expensive method of keeping the company's books. The new schedule authorized is as follows: Business, one-party, $2; two-party, $1.50; residence, one-party, $1.50; two-party, $1.40; four-party, $1.25; rural telephones, $4.20 per quarter.

December 22: Order issued authorizing the Greenwood Telephone Co., of Greenwood, to increase its rates for business, residence and switching service. The company asked for a $1.75 per month rural rate, but the commission found that its rural lines were loaded to excess and that it could authorize no increase until the service was brought up to the standards required by the commission. The switching rate authorized is $5 per year.

December 22: Order issued authorizing the McKinley Telephone Co., of Cumberland, to increase its rates for telephone service to $1.50 per month as a gross rate. The commission found a rather unfortunate condition existing in the telephone business at Cumberland. There are two exchanges there and disagreements between the two companies make it seem impossible to effect a satisfactory switching agreement or any sort of consolidation. The competing company is the Cumberland Telephone Co. The authorized increase of the McKinley Telephone Co. will, therefore, fall short of bringing the company a reasonable return on its investment because of the competition.

December 22: Complaint filed by Robert Hein, of Seymour, against the Seymour-Shiocton Telephone Co. regarding inability to secure telephone service.

December 23: Application filed by Rock County Farmers Telephone Co., of Janesville, for authority to increase its rates for unlimited service from $18 to $21 per year.

December 23: Application filed by Luxemburg Telephone Co., of Luxemburg, Kewaunee county, for authority to increase its rates for switching service for the Montpelier Telephone Co. and the Casco-Luxemburg Telephone Co. from $2.75 to $3.25 per telephone per year.

December 23: Application filed by the Poplar Rural Telephone Co., of Poplar, Douglas county, for authority to increase rates for telephone service.

December 24: Application filed by the Mosinee Telephone Co., of Mosinee, Marathon county, for authority to increase rates for telephone service.

December 24: Order issued authorizing the Elroy Telephone Co., of Elroy, to increase its rates for telephone service. The commission found that the company was operating economically and endeavoring to improve its service and that the old rates in force did not bring sufficient revenue to pay depreciation and a fair return upon the investment. The new rates authorized are as follows: Business, one-party, $1.85 per month, two-party, $1.65; residence, one-party, $1.65, two-party, $1.40; rural, per quarter, $3.75 net.

December 24: Order issued authorizing the Melville Settlement Telephone Co. to increase its rates for telephone service. The company furnishes service in the town of La Fayette in Chippewa county, and has its switching done by the Wisconsin Telephone Co. at Chippewa Falls. The company pays the Wisconsin Telephone Co. $4.50 per year per subscriber for the switching service and virtually every dollar of its former income was used in operating expenses, leaving nothing for depreciation or return on the investment. The new rate authorized is $18 per year payable semi-annually in advance.

December 24: Order issued authorizing the Kegonsa Independent Telephone Co. to increase its rates. The commission found that the company had been violating Section 1797m-90 of the Wisconsin statutes in that it was discriminatory in its charges as between stockholders and non-stockholders. Due to this practice, it appears that the lines have not been properly maintained and are in such poor condition that at the present time it will be necessary to expend a considerable amount of money in order to put them in shape. The commission held that inasmuch as the stockholders own their own telephones as well as the service drop, the company should pay such subscribers a rental covering fixed costs on this equipment. The new rates authorized are $4.80 net per quarter for rural telephones, the stockholders to pay the same rates as other subscribers, and those owning their own telephones to be allowed an annual rental of $1.80 per telephone.

December 24: Order issued authorizing the Sturgeon Bay & Gardner Telephone Co. to increase its rates for telephone service from $9 to $15 per year.

January 5: Hearing on the application of the Badger Mutual Telephone Co., of Webster, for authority to increase rates.

Biographical and Personal Notes

W. C. May, who recently sold his exchange at Gothenburg, Neb., operated under the name of the "Gothenburg Telephone Exchange," to the Nebraska Telephone Co., has left for California, where he will spend the winter. Mr. May states that he will probably be back in the telephone business before many months.

M. H. Buehler, formerly vice-president and general manager of the Chesapeake & Potomac Telephone Co. of Baltimore, Md., will continue as vice-president, upon his succession as general manager by Burdett Stryker.

Philip O. Coffin, formerly auditor of the New York Telephone Co., has been appointed general auditor of the Chesapeake & Potomac Telephone Co., Baltimore, Md.

C. P. Cooper, formerly division superintendent of plant of the New York

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Telephone Co., and lately in charge of the plant department of the Chesapeake & Potomac Telephone Co. at Washington, D. C., has been appointed general superintendent of plant with headquarters in Baltimore, Md.

W. A. Tower, formerly general superintendent of plant of the Chesapeake & Potomac Telephone Co., of Baltimore, Md., has been assigned to special duties.

Clinton Alston has assumed charge of the Provo, Utah, exchange of the Mountain State Telephone & Telegraph Co. to succeed W. D. Woods, who resigned to enter the automobile business in Idaho. Mr. Alston was formerly manager of the Murray, Midvale and Holliday exchanges of the Mountain States company in Salt Lake county, Utah.

Wm. A. Badour has been appointed manager of the Three Rivers, Mich., exchange of the Southern Michigan Telephone Co., which has its headquarters in Burr Oak.

O. W. Fullerton, manager of the Murphysboro Telephone Co. at McLeansboro, Ill., has been transferred to Metropolis, Ill., as manager of the Massac, Ill., county exchanges.

C. Gilbert, local manager of the Murphysboro Telephone Co. at Benton and West Frankfort, Ill., resigned recently to engage in farming, having purchased a farm near Marion, Ky.

G. L. Brown, former manager of the Murphysboro Telephone Co. at Metropolis, Ill., has been transferred to a similar position at the company's DuQuoin exchange.

F. M. Stephens, division plant superintendent for the Southwestern Bell Telephone Co. at St. Louis, Mo., since October, 1917, has succeeded J. J. Robinson as general plant superintendent for Missouri.

Obituary.

Thomas Bromley, manager and treasurer of the United Home Telephone Co., of Muskegon, Mich., and one of the most prominent telephone men of the Middle West, passed away at his home in Muskegon on December 17, after a long and lingering illness.

Mr. Bromley was born in Gaines, Mich., March 16, 1867. When Thomas was three years of age, his parents moved to

The Late Thomas Bromley Made the United Home Company a Strong Property.

St. Johns, where the father was local agent for the old D. & M. Railway for 33 years.

Thomas attended the public schools at St. Johns until 14 years of age, during which time he became familiar with the duties of a telegraph operator and the details connected with the work of a local railway agent. For several years thereafter he served as relief agent and operator at various stations on the Grand Trunk system.

After devoting his time and attention for a number of years to the mercantile business, Mr. Bromley, in 1902, became secretary of the Union Telephone Co. operating a number of exchanges in the state of Michigan. He relinquished that position the same year and assumed charge of the Delaware & Madison Telephone Co. at Muncie, Ind.

Four years later he consented to assume the management of the Lake Shore Telephone Co.—the predecessor of the present United Home Telephone Co.—which then had local exchanges at Hart, Pentwater, Shelby, Ludington, Scottville, Whitehall and Montague, Mich.

Although shrewd business men of Hart were of the opinion that the corporation was hopelessly insolvent, Mr. Bromley saw possibilities of expansion and development, and proceeded to bring order out of chaos. He worked very hard during the next 10 years and succeeded in building up a splendid property which is a fitting monument to his executive ability and keen judgment.

One of the first things he did was to merge the old company into a new organization known as the United Home Telephone Co. In 1913 the company took over the Muskegon Telephone Co., with exchanges at Muskegon, Coopersville and Ravenna. Under Mr. Bromley's supervision exchanges were rebuilt, new equipment installed and the company's headquarters moved from Ludington to Muskegon.

Only a few years ago Mr. Bromley succeeded in putting through a deal for the purchase of the Bell interests in his company's territory, thus leaving the United Home in sole possession of the local field.

Mr. Bromley was a potent factor in the development of the Independent telephone industry in his state and his loss is keenly felt by his friends and business associates. He will be remembered as a man of strong character and high standard of business integrity who lived up to his ideals of fair and honorable dealings.

From Factory and Salesroom

Conventions: Minnesotta, Minneapolis, January 27, 28 and 29; United States, Atlanta, Ga., February 4, 5 and 6

Opens Office in Minneapolis As Expert Accountant.

T. C. Macoubrey, an expert accountant with more than 11 years' experience in the telephone field, has opened an office with the Minnesota Independent Telephone Association at 922 McKnight building, Minneapolis, Minn., where he will specialize in telephone accounting.

The service Mr. Macoubrey is prepared to render telephone companies includes the preparation of annual reports to the Minnesota Railroad & Warehouse Commission, the making up of corporate income tax returns and annual audits. It is his intention to interest Class C and D companies in having their general books kept in Minneapolis, a plan which is being successfully carried out in other states.

Mr. Macoubrey was formerly assistant general auditor of the Tri-State Telephone & Telegraph Co., having been with the organization 11 years at the time of his resignation. Prior to that time he had a number of years' experience in other lines of accounting.

Electrose Strikers Return and Get Unexpected Increase.

A strike of seven weeks' duration for better hours, wages and the closed shop, ended unexpectedly when 200 hydraulic press workers and machinists walked into the office of the Electrose Mfg. Co., at 60 Washington street, Brooklyn, N. Y., and asked for re-instatement under the old terms.

The strikers were agreeably surprised when Louis Steinberger, president and manager of the corporation, informed them that they would return at a wage

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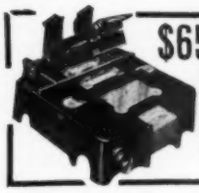
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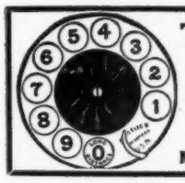
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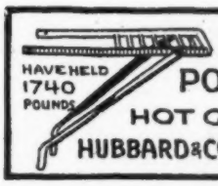
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increased by 15 per cent over what they had formerly received. This increase, he said, had been determined upon by the board of directors at a meeting held just before the men went out, but as the leaders had given no intimation of the fact that they were dissatisfied and had made no efforts to arbitrate, there had been no opportunity to inform them of this decision.

Mr. Steinberger, in accounting for the strike, which he said had not been anticipated, attributed the walkout to the work of half a dozen agitators, who were new men in the shop. He said the men decided to return when they saw that the company was beginning to employ ex-soldiers and sailors in their places. Mr. Steinberger said that these new men will also be permanently retained.

Los Angeles Office to Handle Roller-Smith Apparatus.

The Roller-Smith Co., 233 Broadway, New York City, announces that its California representative, the Electric Material Co., 589 Howard street, San Francisco, has opened a Los Angeles office in the Title Insurance building.

The Los Angeles office is in charge of E. H. Bell, who has had extensive experience in marketing electrical products.

The Electrical Material Co. handles the Roller-Smith lines of electrical measuring instruments, watt-hour meters and circuit breakers in California, Nevada and parts of Oregon and Idaho.

Ogden Represents Kellogg in Southern Ohio and W. Virginia.

B. A. Ogden was born at Salina, Kans., December 22, 1878, and was educated at Hillsboro, Ohio. Prior to 1902, he was with the Bell company in Ohio and Indiana in the capacity of manager, solicitor, city foreman and construction foreman.

Mr. Ogden entered the Independent field as wire chief for the Mt. Sterling Telephone Co., of Mt. Sterling, Ohio, in February, 1902, with which organization he remained for three years, leaving there to join the maintenance department of the United States Long Distance Telephone Co. at Columbus, Ohio. After having been in the employ of this company for some time, he was connected with the Union County Telephone Co., of Marysville, Ohio, in the capacity of wire chief and assistant manager, remaining in that position for three years.

Severing his connection with the Union County company, Mr. Ogden went to the Clinton Telephone Co., at Wilmington, Ohio, as superintendent of equipment for its entire property, which position he held for ten years. His next change brought him into the sales field, when he joined the forces of the Monarch Telephone Mfg. Co., of Ft. Dodge, Iowa, covering territory in eastern Iowa, southern Wisconsin, Illinois, Indiana, Michigan and Ohio.

June 1 of this year Mr. Ogden took up sales work for the Kellogg Switchboard & Supply Co., working in southern Ohio and West Virginia, reporting to the company's Columbus office. He should, from his varied experience in the telephone field, do some effective work in this territory.

B. A. Ogden, a Recent Addition to the Kellogg Company's Sales Force.

Paragraphs.

COOK ELECTRIC CO. is now located in its new offices at 900-908 W. Van Buren street, Chicago. A branch factory is also in operation at this address as the facilities of the old plant are inadequate for the present demands upon it.

H. W. JOHNS-MANVILLE Co. announces the removal of its Des Moines office to more modern quarters at 213 Ninth street. W. B. Roberts, Des Moines manager, says that the new location will give him better facilities than ever for serving Iowa with asbestos and magnesia, electrical, automotive equipment, and allied Johns-Manville products.

THE MECHANICAL MEMORY SYSTEMS Co. has been incorporated with offices at Aurora, Ill., to manufacture a visible control system. As the name of the company implies, it will furnish a mechanical memory to the executive's desk, affording a visible schedule of pending work at all times. A booklet explaining the system and its method of operation may be obtained from the company upon request.

How the Cuban Youngster Plays "Telephone."

The following story is vouched for by an American engineer just returned from a trip to Cuba.

Going from Havana to Santiago one day, this engineer was much amused by the antics of two small boys, one a Cuban about five years old, and the other an American lad of eight. Neither could speak the other's language, so the engineer was commandeered as an interpreter.

In the course of their play, it became necessary for the Cuban lad to "telephone" to his American playmate, and with true histrionic instinct, the Cuban boy lifted an imaginary receiver from an imaginary hook, and started to turn an imaginary dial to make his call, for since he was a resident of Havana, where the automatic system is used exclusively, he knew nothing about calling "Central."

The American boy was a bit puzzled at this performance, but at the present rate at which the dial is being adopted in this country, it will not be long before youngsters in many cities will also "turn the dial" when playing "telephone."

OPPORTUNITIES

(Continued from page 43)

POSITION WANTED

POSITION WANTED—By experienced telephone man, as wire chief, or switchboard and equipment repairman. Prefer small company in central states. Address 3958, care of TELEPHONY.

WANTED — Position as trouble shooter and lineman for small exchange. Kansas or Missouri preferred. Eight years' experience, seven with one company. Can furnish good references, bank and others. Address 3957, care of TELEPHONY.

AUTOMATIC ENGINEER—Sixteen years' experience, ten years managing Automatic exchanges, desires connection as managing engineer or superintendent of equipment and traffic with company adopting Automatic. Address 3954, care of TELEPHONY.

POSITION WANTED—First-class cable splicer wishes to connect with growing company, local or district position. Prefer middle west. Address 3955, care of TELEPHONY.

HELP WANTED

WANTED—Several telephone engineers to assist in inventory and appraisal work with a large Bell Company. Other positions also open, including equipment and toll line engineering. Address I. A., care of TELEPHONY.

WANTED—First-class switchboard men and P. B. X. installers by a large telephone company operating in the Middle West. Steady work and good wages. Address 3949, care of TELEPHONY.

WANTED—A man with family to take charge of and operate an exchange with about 135 subscribers; house and barn rent furnished, address with reference, 3948, care of TELEPHONY.